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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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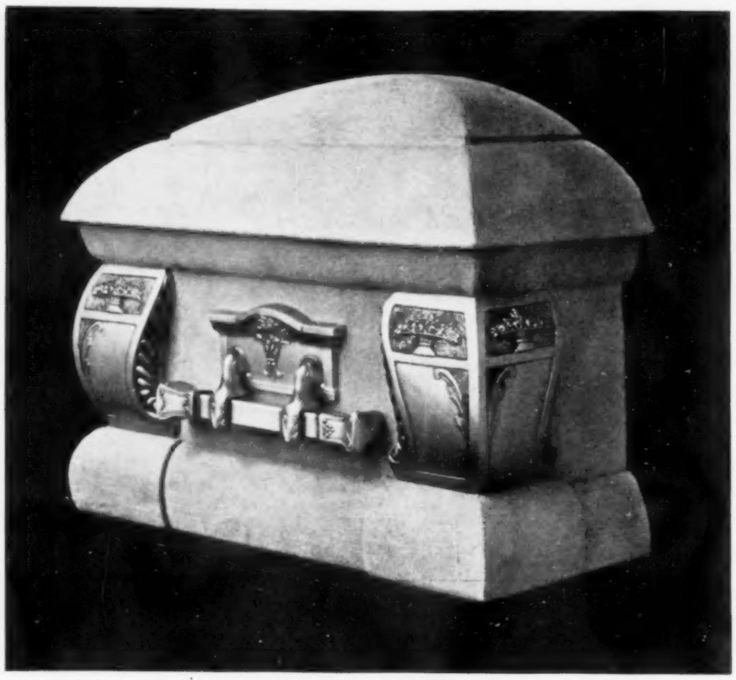

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Casket showing spelter corners and handle finished with Egyptian Lacquer. Courtesy of Zeeland Ornamental Co., Zeeland, Mich.

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Vol. 25 NEW YORK, APRIL, 1927 No. 4

Alloys of Precious Metals and the High Frequency Induction Furnace

Manufacturing Dental Alloys from Waste Materials by the Aid of This Type of Electric Furnace

Written for The Metal Industry by REGINALD V. WILLIAMS, Williams Gold Refining Company, Buffalo, N. Y.

ECONOMIC EXTENT OF THE INDUSTRY

The principal business conducted by the firms in this particular specialized field of the metal industry, is the recovery of precious metals from ores, dental jewelers and photographers waste materials, and the conversion of recovered metal into various products consumed by jewelers, dentists and special industrial or chemical demands.

Of the problems encountered, the manufacturing of dental gold alloys presents the most difficulties and is of consequence, the most interesting. It has been estimated that approximately twenty million dollars worth of gold bullion is consumed annually by dentists. The platinum consumed purely as an alloying element and exclusive of that used in artificial teeth, possibly amounts to a million dollars. The amount of silver consumed as an alloy is also high.

This demand is supplied by approximately sixty manufacturers of whom one half dozen or so have national and world wide distribution. Actual figures on this subject have never been compiled but will undoubtedly be undertaken in the future. The distribution of the products of the larger manufacturers is handled in the usual manner by the dental dealer or depot. There are usually several distributors in every fair sized city. Inasmuch as approximately one third of the total sales of the average dental depot consists of precious metals, some very interesting if not absolutely accurate comparisons might be drawn.

Let it be assumed that gold alloy sales are twenty millions annually, then the sales of total merchandise to dentists would be sixty millions annually. The gold inlay placed in a patient's mouth does not contain over an average of one dollar's worth of gold. The time consumed, however, in the cavity preparation, the technique of waxing, investing, casting and so on, represents by far the dentist's greatest overhead and expense. Representing his fee to the patient as ten per cent of the intrinsic value of the metal, which is exceedingly small, the minimum of total fees paid to dentists would aggregate two hundred and fifty millions of dollars annually.

This has nothing to do with the metallurgy of the metals used by a dentist, but is merely an insight into the increasing importance of the profession and to his position in the minds of the public. The materials which he uses must be of the highest quality and of physical specifications exactly suitable for each special requirement. Solely for dental requirements, the larger manufacturers turn out in excess of two hundred different alloys of precious metals.

TYPES OF ALLOYS

Metallurgically or for purpose of comparison, the precious metals used in dentistry may be grouped into three classes, as follows:

1. Pure metals (gold, silver, platinum).
2. Simple alloys.
3. Complex gold-platinum alloys.

The production of group one, or the pure metals, is chiefly a matter of expert chemical and mechanical knowledge. These metals are placed on the market in a large number of shapes, such as rolled sheet, wire and so on. Almost everyone is familiar with gold, silver and platinum in the form of foil. It is interesting to note that the process of manufacturing, or the beating of foil, has not changed materially in the last fifty years. Foil is beaten quite successfully by machines, but the hand hammered product continues to be superior. These pure metals are also marketed in various pure crystalline forms, accomplished by chemical or electrolytic processes. Gold in this shape consists of finely interlocked fern like crystals. The standard weight, as sold in a container to a dentist, is one-tenth ounce troy. The pure deposited crystals are subjected to a molding and annealing process, which imparts definite shapes for convenience in handling, also imparts considerable mechanical strength. The appearance of the finished product is very similar to suede leather or sometimes sponge rubber. When using this gold as a filling material, for the purpose of retention, a dentist will very carefully prepare the tooth cavity with a number of undercuts. The sponge, crystal or mat gold may be packed into the cavity either by hand pressure or by a mallet. Foil fillings are invariably malleted.

Extremely large quantities of this class of filling material have been consumed by the dentist, however a development of recent years, namely, the casting of dental

restorations, has replaced to a great extent, the hand plugged or malleted filling. These hand plugged fillings, however, still enjoy a considerable sale. They possess points of merit as a dental restoration, not possible to obtain in the ordinary cemented-in cast gold inlay.

Class 2, or the simple alloys, consists of pure gold to which has been added small quantities of copper and silver. These metals form solid solutions, miscible in all proportions, and are added to gold for the purpose of imparting additional strength and hardness. They increase the tensile strength from approximately thirty thousand pounds to sixty thousand pounds per square inch. There are a number of alloys of this group, and they vary, of course, considerably in hardness and ductility. These metals

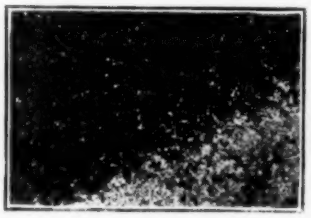

FIG. 1. PHOTOMICROGRAPH OF GOLD-PLATINUM COMPLEX ALLOY, SHOWING VERY DECIDED SEGREGATION. MAGNIFIED 125 DIAMETERS

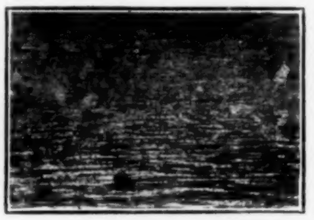

FIG. 2. WIRE DRAWN FROM BILLET CONTAINING SEGREGATED METAL; 30,000 LBS. PER SQUARE INCH WEAKER THAN UNIFORM WIRE

alloy with each other quite well in the ordinary flame type of furnace. After casting into billets, they are rolled into plate of definite thickness, usually 30 ga. B & S., or swaged and drawn into wire, or sometimes manufactured into special shapes or forms such as seamless crowns or shells.

Aside from these ordinarily quite ductile metals or alloys, the dentist also requires metal in plate and wire form, of almost every conceivable cross section, possessing great strength and springiness, yet capable of being bent and manpiulated, under conditions which would render ordinary alloys useless. They, of course, must not oxidize under mouth conditions. They must be quite high in fusing point so as to asure perfect safety when being soldered to. When heated to redness, such as is necessary in a soldering operation, they must not lose their springiness nor should an oxide be formed difficult to remove. The dentists also demand certain colors or shades, ranging from dark gold to platinum gray or white. Not only do they demand these characteristics in wrought metals, but also in ingots which they melt and cast for restorative work. The casting procedure consists briefly of pouring a fluid, porous refractory material, called an investment, into a flask, completely surrounding a volatile wax pattern. The refractory or investment material, composed principally of silica and plaster of Paris, hardens comparatively quickly and the wax pattern is dissipated by heat. The molten gold alloy is introduced into the void or mold by air pressure, centrifugal force, or other means.

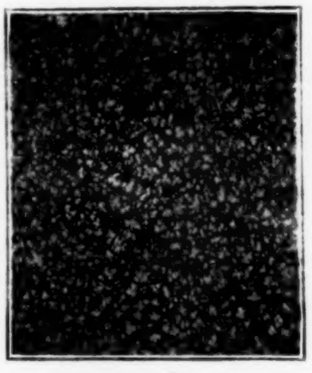

FIG. 4. UNIFORM COMPLEX GOLD-PLATINUM ALLOY. MAGNIFIED 125 DIAMETERS

The alloys designed for this particular class of work may be classified under group three. They are known as the spring golds, the hard golds, the elastic golds, and almost the entire group of casting golds, of which there must be a minimum of at least six different alloys, and possibly as high as twenty or thirty. To obtain these desirable characteristics, to pure gold is added varying proportions of silver, copper, platinum, palladium, iridium, nickel, zinc, and sometimes, although of doubtful value, tin, iron, tungsten, chromium and possibly other metals. The alloys must be of certain color and capable of taking a high polish. They must not oxidize in the mouth or even very greatly at red heat. Some of the alloys of this group must be exceedingly high in tensile strength, yet also high in percentage of elongation or ductility. Inasmuch as some restorations are constructed in parts and then united with solder, of fusing points sometimes higher than sixteen hundred degrees F., the metal must obviously be of comparatively high fusing point so as to eliminate any danger of melting. The metals used exclusively for casting must be mixed so as to melt quite easily under the average blow-torch, bearing in mind, of course, that the dentist in rural districts might not have gas at his disposal or sometimes even compressed air. The metal must not bubble, splutter, or "gas" when being melted. It must be extremely fluid when molten so as to reproduce fine details of the casting. It must not be subject to great shrinkage. Inasmuch as the dentist has no method other than the eye for determination of casting temperatures, and no two wax patterns or volumes of metal are ever identical, the range of temperature for production of sound castings must necessarily be quite wide. An alloy requiring exacting methods of melting or pouring would be quite useless. Certain metals after casting, must be hard and springy, yet sufficiently ductile so as to allow for certain bending or adjustment. Besides these metallurgical and mechanical features there is also the problem of color.

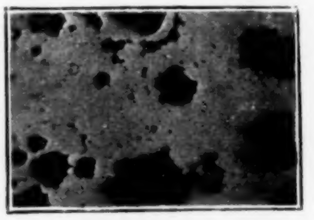

FIG. 3. BLOW-HOLES IN A GOLD-PLATINUM ALLOY; CAN BE REDUCED BY CASTING AT PROPER TEMPERATURE, ALSO BY MELTING AND CASTING UNDER A VACUUM.

Platinum is added to these alloys because it will not oxidize under any conditions, because it imparts additional strength and hardness, although it is true, not in the same proportion as some other metals, because it raises the fusing point to provide safety in soldering, also because it promotes an inconspicuous color. Alloys containing platinum are also not subject to such wide changes in physical characteristics or mechanical proper-

FIG. 5. WIRE DRAWN FROM ALLOY SHOWN IN FIG. 4. TRANSVERSE VIEW

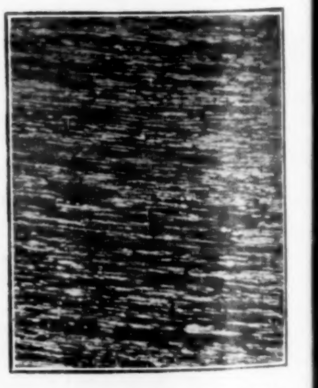

FIG. 6. WIRE DRAWN FROM ALLOY SHOWN IN FIG. 5 LONGITUDINAL VIEW

ties, when subjected to red heat. This is of importance to the dentist because in the great majority of instances, he has not the proper equipment, nor in some instances the proper information or knowledge to restore the maximum springiness to an appliance or restoration from which the springiness has been removed by soldering or other heat treatment. There are some types of patients, and even dentists, who demand metals of rich gold color, due possibly to the common conception of the greater value and durability of gold as against the "silvery" color of the high platinum content alloys. There is also an obvious cleanliness about a highly polished gold inlay or restoration, not to be obtained in any metal of dull appearance. The class of patient, however, who takes pride in a

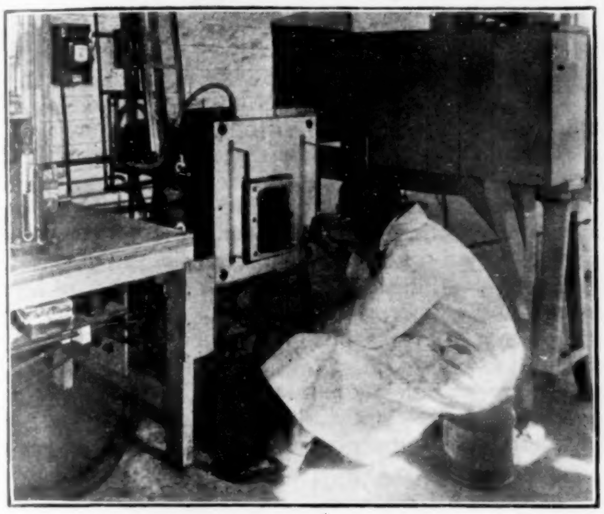

FIG. 7. EVACUATED HIGH FREQUENCY FURNACE IN POURING POSITION

dazzling smile or any conspicuous gold restoration is greatly on the decline, and in fact almost extinct. It still seems necessary though that metal be used as the backbone of almost all dental restorations, and of course, the precious metals are the only ones permissible.[1]

Some of the metals required for casting must be quite ductile or soft so as to permit easy burnishing of the margins. Others must be considerably harder so as to withstand the stress of mastication, yet not so hard that the normal wear from mastication will be greater on the tooth than on the metal. This would result in exposed or leaky margins and possibly other difficulties. Some metals after casting in thin sections must be capable of being swaged. Other metals, such as those used to retain restorations in the mouth by means of "clasping" other teeth, must be exceedingly hard and springy, yet capable of minor adjustment.

MANUFACTURING DIFFICULTIES

It can be seen that this field though small, is filled with a large number of rather knotty problems. The entire procedure of dental casting consists of a number of variables of which the actual melting and casting of the alloy is but one. In common with all human weaknesses, there has been a tendency to place the blame for a failure in casting, on the materials used, whereas the trouble might easily lie in a faulty procedure or technique. The tooth or other preliminary preparation is, of course, quite important, also the preparation of the wax pattern, the investing in the refractory material and the dissipating of the wax pattern.

The manufacturing of these gold-platinum complex alloys which we know as group three, is easily the hardest problem with which the manufacturer of dental alloys has to contend. The specific gravity of the component metals range from seven to twenty-one. The fusing points from 550° F. to in some instances 4,290°. The melting and casting into homogeneous billets, in a great many instances, is exceedingly difficult. The highest temperature attainable in the standard oil or gas furnace is seldom in excess of 2,900° F. For special alloys containing high percentages of the platinum group metals, sufficient temperature is in itself a problem. Crucibles capable of withstanding this heat yet still retaining sufficient mechanical strength to be grapsed by tongs for pouring twenty-five to fifty ounces of this metal, is another problem. Even of greater importance is the fact that it has been found impossible to produce uniform alloys of gold containing five to twenty per cent of platinum in any flame type of furnace. The ordinary procedure followed is to add platinum to the melt in the finely divided form of sponge. After melting and casting, the billet is rolled into thin sheet, clipped into small pieces and then remelted and cast. This procedure might be repeated a number of times until the billet finally appears to be perfectly homogeneous and cast satisfactorily. The hazard of non-uniformity or segregated platinum, however, is always present. The finished cast billet is usually rolled to approximately 20 gauge and cut into small ingots of one dwt. each. It is then marked according to platinum content, or the particular use for which it is intended. This might be a trade name or symbol. If the alloy is not unfform, it is possible for a dentist to receive two ingots from the same melt containing a wide variation of platinum, consequently a great variation in characteristics.

Aside from the problem of non-uniformity, great difficulty is experienced in the casting of billets, either flat or

CHART 1

	Alloy	Maximum difference in assay between centre and outside	Remarks
		Per 1,000	
1	Au, 900 Pt, 100	58.9	
2	"	30.6	Heated in oil furnace, melted several times and thoroughly stirred.
3	"	19.7	No. 2 alloy remelted.
4	"	27.2	No. 3 remelted in oxy-hydrogen flame in lime furnace.

CHART SHOWING THE IMPOSSIBILITY OF OBTAINING UNIFORM ALLOYS OF GOLD CONTAINING FIVE TO TWENTY PERCENT OF PLATINUM IN ANY FLAME TYPE OF FURNACE. MATTHEY, PHIL. TRANS., VOL. CLXXXIII A (1892), P. 629.

round, free from blowholes and inclusions. The rods of course are swaged and drawn into wire, the flat billets rolled into sheets. In all instances, there is found the usual shrinkage cavities, blow-holes, also pipe structure, extending in some instances throughout the entire billet. There also might be voids in the interior of the metal, of shapes quite different from those caused by occluded gases, due possibly to localized shrinkage. The dentist when making his small castings from these complex alloys, of course encounters the same problems.

Chipping or milling of the plant ingots was not found to effect any great improvement. In the ordinary flat ingot, containing high percentages of platinum, the area greatest effected by shrinkage and containing the maximum of defective metal, is of a V shape in the center upper portion of the billet. The soundest metal can be found adjacent to the edges of the ingot mold.

This article will be concluded in an early issue.—Ed.

[1] A stainless steel is being used in Germany, but introduction into this country has not yet met with any great success.

Still Casting of Metals

A New Method of Casting Alloys Containing Aluminum. A Paper Read at the New York Meeting of the Institute of Metals Division, February 14-17, 1927

By P. H. G. DURVILLE,
Consulting Metallurgist, Paris, France

Any metal which contains even a small percentage of aluminum possesses certain peculiarities of appearance and properties which are exhibited both when the metal is melted and after it solidifies. Pure aluminum, or an alloy containing a small proportion of aluminum, can be melted without flux—except for a layer of charcoal—because a film of aluminum oxide and metal forms at the surface of melted aluminum. Although very thin, this film is air-proof, and it prevents the metal underneath from oxidizing. This oxidized film does not move easily, on account of its toughness and surface tension.

One very important point in connection with this process of still casting has not been strongly enough stressed, namely, that the same kind of surface film with the same peculiarities forms over the surface of all melted alloys that contain even a small proportion of aluminum. Experienced foundrymen know how desirable it is to cast aluminum under its "skin" or under the surface of the film which tends to remain still.

In the case of red copper, when in fusion, the surface shows pure copper only. This is due to the fact that liquid copper constantly absorbs the copper oxide which forms on the surface. By closely examining melting copper the oxide can be seen dissolving in the bath, and going into solution just as pulverized sugar dissolves in water. When copper is cast in the open, either in wire bars or cakes, the surface of metal exposed to the air is covered by a film of black oxide that cannot be absorbed by the metal.

MIXING ALUMINUM AND COPPER

When aluminum is added to copper in even such small amounts as 0.50 to 0.75 per cent., the surface of the alloy shows a totally different aspect from the surface of copper alone. A film similar to the one formed on the molten aluminum forms on the alloy of copper aluminum. This film, like the one on pure molten aluminum, is rigid and coherent, and does not dissolve in the copper. This skin, or film, is often erroneously described as foam and is so stiff that it crumples up when removed by a skimmer. A new film instantly forms behind the skimmer and covers the exposed surface. This phenomenon repeats itself indefinitely, and the raw material is never visible.

The surface of cast ingots of copper-aluminum alloy do not show the black film of the oxide of copper, but show instead a bright-red or gold-colored film crumpled and creased similar to the pure aluminum one when freshly cast into ingots. Due to the presence of aluminum there is a tendency to shrinkage, and this shrinkage appears on the top face of the ingot where there is a sinking around the crystals already formed.

ALUMINUM IN BRASS

Exactly the same result follows the addition of aluminum to brass. The zinc fumes rising from the surface of the melted metal are oxidized immediately. The resulting oxide is a grayish-white powder, most of which remains on the surface of the bath and has the appearance of incandescent moss, whereas some escapes into the air and is entirely lost.

When brasses are cast into ingots in the open air a dull gray crust forms on the surface. The addition of even so small an amount of 0.50 to 1 per cent. aluminum to the melted brass is sufficient to transform instantly the appearance of the surface of the bath. This skin or film, which indicates the presence of aluminum in the mixture appears and remains "still" on the surface of the bath. It is tenuous and sufficiently rubber-like to stop entirely the undesired evaporation of the zinc. This desirable feature is attained, however, only after the agitation caused by the alumino-thermic reaction is calmed. If the surface of the aluminum-brass mixture is stirred with a skimmer, and an opening is made in this film, the evaporation and combustion of the zinc start in again around the skimmer, but stop immediately as the alumina film forms. Therefore, it is impossible to see the bare surface of the ternary alloy copper-zinc-aluminum at any time, as was also the case with the binary alloy copper-aluminum as described above.

When copper-zinc-aluminum alloys have been cast into ingots they have certain distinguishing characteristics. The surface in contact with the air presents a clean, shiny, golden-yellow color, wrinkled and creased because of the minute foldings which the aluminum film undergoes while cooling. The dull crust, which ordinarily covers brass ingots containing no aluminum, has given way to a perfectly clean and smooth skin like new gilding; here again the phenomenon of shrinkage is accelerated.

An examination of the alloys of copper and nickel, nickel-bronze, copper-zinc-nickel, or nickel-silver shows the same phenomenon as in the two instances described, with the exception that an addition of aluminum as small as 0.25 to 0.30 per cent. generally suffices to cause the appearance of the characteristic film.

In these alloys, as in the brasses, the addition of aluminum suffices to stop the evaporation of the zinc despite the high melting point of nickel-silver. These aluminum alloys once ingoted present a shiny and wrinkled skin instead of the dull, dirty-looking crust that is characteristic of this kind of an alloy when it does not contain aluminum. It is therefore plainly seen that this phenomenon of transformation of the physical properties in the melted state (by the addition of small percentages of aluminum) is general for commercial alloys of non-ferrous metals.

ADDITION OF ALUMINUM TO FERROUS METALS

Various investigations in the metallurgy of iron have established the fact that the phenomenon due to the presence of aluminum takes place also when aluminum is added to ferrous metals.

Small quantities of aluminum added to melting steel calm the bath immediately by suppressing the bubbling to which melting steel is subject. The amount of aluminum added to produce this effect must be very small, otherwise the formation of aluminum oxide causes trouble during the tapping operation. Observations show that the addition of about 1 per cent. of aluminum to ferrous metals causes the formation on the surface of the bath of an aluminum fim having the same characteristics and properties as the film that formed on the molten copper alloys. Therefore it can be considered proved

that the appearance of a tenuous or tough film is an indication of the presence of 1 per cent. or more of aluminum in the alloys.

Thus far it has been shown that the alumina film forms constantly and instantaneously on the surface of melted metal containing aluminum which is in contact with the air. It is very important to note that this film once formed can never be melted again, and, also, that it never dissolves. If it does seem to disappear during the course of the operations it is only an illusion, and its flakelike particles are merely swimming around beneath the surface of the mass of melted metal.

FILM FORMATION PHENOMENON

From the moment aluminum is added to a melted alloy any operation, such as mixing, pouring or transferring from one ladle to another, must be made with special precautions to prevent agitation, because this will result in the formation of a more or less thick moss consisting of bits of metal that are caught in the folds of the film wherever it forms. This moss will rise to the surface and appear in the ingot head, and a large amount of it attaches itself either in the neighborhood of the spot where the metal is being poured, and in the molds along the sides of the receptacle, especially in the ingot molds, thus forming spongy zones in the ingots or molded pieces.

This phenomenon is the main cause of the large metal losses which have been considered as inevitable in the manufacture of aluminum alloys and especially of the aluminum bronzes. The formation of solid aluminum oxide dross during the solidifying and the shrinkage of the cast pieces has given rise to the bad reputation which has attended the development of aluminum alloys by the methods that have been in use for years.

However, these metal losses are not necessarily inevitable because they are due solely to agitating the bath of metal after the addition of aluminum. In order to avoid these undesirable conditions, it is clear that aluminum alloys should not be poured in the same manner as those not containing aluminum.

INGOT CASTING

Ordinary casting operations using strainer gates are not adaptable to aluminum alloys, because they result in a large percentage of waste without obtaining sound products. If a strainer gate is used the metal falls in the ingot molds after passing through a funnel which is drilled with a number of small regular holes. This is the pouring method generally used for casting brass plates, and it presents several advantages. It permits the operator to regulate the flow of the metal by the diameter of the holes, and, therefore, requires no special skill on the part of the molder who has only to keep the funnel full. The speed can be carefully calculated and sufficiently reduced so that as the metal begins to solidify it feeds itself upon itself regularly, as the process of filling continues, thus giving a homogeneous metal and reducing to a minimum the shrinkage of its upper surface if the speed has been well calculated.

It would seem at first glance that this automatically-regulated pouring, which helps to decrease the shrinkage, would be precisely the method required for casting aluminum alloys, where even a very small quantity of aluminum greatly increases the shrinkage. But costly experiments have proved that this process is entirely wrong, and it has had to be discontinued, as explained elsewhere, because of the high percentage of dross.

In order to obtain satisfactory results in pouring and casting aluminum alloys, it became necessary to devise and employ totally different casting methods, and it is toward these methods that research has been directed since the peculiarly valuable properties of aluminum and its alloys have been recognized.

"COULEE TRANQUILLE"

Any kind of an aluminum alloy which is to be transformed into rolled products, or used directly as molded products, must be poured with a minimum of agitation. This has been accomplished by the new method technically known in France as "coulee transquille," i. e. "still casting process."

TILTING PROCESS

The tilting method of still pouring is characterized by rigid union of the ingot mold and the ladle. The melted metal is first poured into the ladle and then cleaned of any dirt which has been produced by this pouring. The mass of melted metal is then transferred to the ingot mold with a minimum of disturbance by tilting the whole system on a vertical plane. This process is well protected by patents in Germany as well as in the United States. It has been successfully developed in France for pouring aluminum bronzes and is now being introduced into this country.

The tilting process has many advantages, but it also presents several disadvantages. It requires costly machinery, double pouring and a certain difficulty in greasing the ingot molds. Moreover, this method cannot be applied to certain delicate alloys. In order to avoid a weakened crystallization during the first solidification of certain alloys which are hot short, they must be poured in such a way as to achieve a structural symmetry in the ingot which is difficult to obtain in the different phases of the tilting. Lastly, it is sometimes difficult to tilt slowly enough to keep the shrinkage at a minimum. These disadvantages are, nevertheless, largely compensated for by reducing the number of skilled laborers needed because, as in the case of die casting, all of the operations of ingot molding can be performed mechanically. Another fully as important compensation is the almost perfect surface of the ingot, and the consequent reduction of waste which has been the bane of the aluminum bronze industry.

BOTTOM-POURING

The other method of "still casting" known as bottom-pouring is also patented in the United States, and in Germany, Great Britain and France, as well. By means of certain additions to the mold, this process makes possible the manufacture of castings which are not readily handled by the tilting process.

In bottom-casting the metal is introduced into the mold with a minimum of agitation by means of a gate which is built up to its full height during the pouring operation; at all times it is at a very short height of fall, which prevents mixing in the dross caused by the wrinkles of alumina film. This method is even better for some purposes than the direct pouring with strainer gates, because the pouring can be done very slowly, thus reducing shrinkage to a minimum.

Bottom-pouring permits the casting of very large sizes for molding as well as ingot casting, and at the same time retains the advantages of greasing the ingot molds. Furthermore, structural symmetry can be obtained when desired, and lastly, the bottom-pouring process can be entirely mechanically operated if necessary. Skilled labor can be eliminated to a very large degree in both the tilting and bottom-pouring process.

Articles, describing in detail certain types of "still casting," can be found in The Metal Industry for December, 1919, page 507-9, and March, 1920, page 118-120.—Editor.

The Fundamentals of Brass Foundry Practice

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Operations*—Part 9

Written for The Metal Industry by R. R. CLARKE, Foundry Superintendent

Among the many unfortunate results of shrinkage are the weakening and consequent failures of castings, either in test or in service. Usually the cost and loss include the machining of the castings which adds to the misfortune. A valve leaking in test or a flanged bushing breaking at the flange in service mean more than merely scrapping a rough casting. Often pattern design is at fault and might be made more favorable. The foundry end and the effect of design on the strength of the casting are subjects that should be carefully considered in the making of every pattern. We pause to submit a single illustration,

Figure 31 represents in cross section, a flanged axle lining in which the bulk of the flange greatly exceeds the adjoining bulk of the body. Many patterns come to the foundry exactly as sketched, though in all such linings a radius is machined on the front end as per dotted line. Now, if this radius were in part included in the pattern and the rough casting, the heavy bulk of metal in that vicinity would be materially lightened to a decided foundry advantage. Another common discrepancy in many of these patterns is the lack of a fillet at the flange-body union leaving a sharp angle of sand in the mold. Any molder knows the difference between a rounded and a square corner as effecting drawing tendency in metal and molders often cut fillets on molds even when not shown by the pattern. The pattern should include them and the square corner should be eliminated wherever possible. Analysis of the draw or check from a square corner can be studied from Fig. 32.

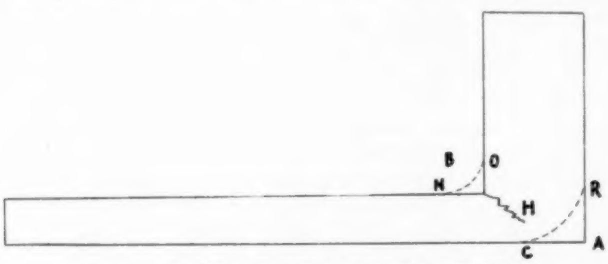

FIG. 31. FLANGED AXLE LINING—CRACKED

From radiating surfaces "AB" and "CB" two congealing lines set up at right angles to each other. Metal around point B remains plastic while the two congealing lines AB and CB draw from it and produce the fracture.

EFFECT OF GRAVITY

Gravity is the force by which bodies are attracted toward the centre of the earth. It acts perpendicularly downward, affects all bodies the same, and exercises a constant force which in turn accounts for acceleration of motion (increase in speed) which all bodies attain in falling through any distances. Thus a ten-ton weight of iron and a one pound weight of aluminum falling through vacuum will drop the same distance in the same time and with the same increase in speed. They will not, however, hit the earth with the same force or impact. The ten-ton weight will strike far the harder because of its "quantity" of motion. This quantity of motion in a body is known as its "momentum" and is equal to the rate of motion (velocity) multiplied by the weight of the body. Gravity, of course, affects the velocity and momentum of liquid metal dropping from different heights, with its impact on the sand in striking. Provision is made to reduce this velocity momentum and to absorb the shock of the impact by liquid present in the sprue and by controlling the rate of motion or the velocity of metal in transit through the gates into the mold.

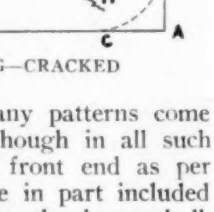

FIG. 32. HOW THE CRACK FORMS

If metal be dropped sixteen feet from the lip of a ladle to the bottom of a sprue, its velocity at striking would be sixteen feet per second and its momentum in striking sixteen times its weight. The higher the drop of metal in pouring, the greater the velocity and impact against the sand in striking. It is therefore quite obvious that to reduce the velocity and impact within reason is a wise thing to do and can be accomplished by breaking or partitioning the drop gate or sprue of the mold. (Fig. 33.) If at the bottom of a sprue a cup-shaped basin be constructed, and the bottom of this basin be soft or cushion-like, then the first metal dropping is the only metal striking the sand, all succeeding falling metal dropping into a pool of metal of its own making. Such is the button gate underlying a sprue and acting as a shock absorber as well as a means of keeping the dropping metal from spattering.

Partitioning of drop sprue is to avoid height of drop and to impact on sand at bottom. Dropping down perpendicular distance AB the metal would strike at the velocity of 4 feet per second on sand B and tax it severely. By partitioning the gate into 12-20 and 16 inch sections from top downward we reduce the velocity to one foot, 1 foot 8 inches and 1 foot 4 inches respectively and the impact at NO and R become relatively less. In partitioning gates into unequal sections the longest sections should lie between the top and bottom sections rather than to be the top and bottom sections. To the top section the height of the pouring lip above it increases the drop by its distance, while the final drop of metal at the bottom should never be any greater than possible in the interests of undisturbed delivery of the metal to the mold. The bottom

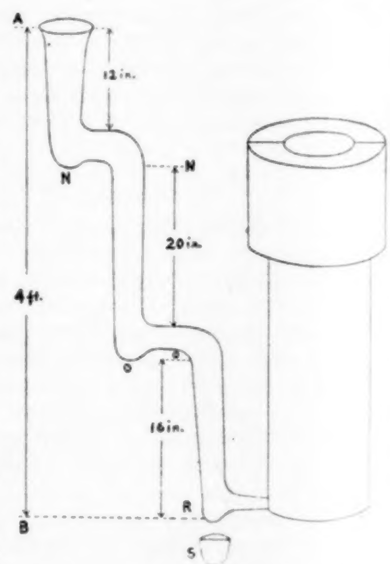

FIG. 33. BROKEN FALL IN POURED METAL

gate shown in cross section should underlie every drop section of the sprue to absorb shock of impact and avoid spattering of metal when falling on a flat surface.

Sprue pressure derives fundamentally from the weight or gravity of metal per unit of surface in the sprue, hence the principle previously stated, that sprue pressure varies with the specific gravity of the different metals. A stream of aluminum and a stream of iron poured down the same gate will attain the same velocity in the same time and distance but not the same momentum. The momentum will vary with specific gravity, as will also the impact. It is therefore plain that the higher the specific gravity of the metal poured, the greater the precaution against momentum and impact in the parts of the mold engaging the current.

Hydraulics treats of liquids in motion. Its principles are closely allied with those of falling bodies, though in practice conditions make many modifications. A ⅛ inch cope or height of sprue will give motion to fluid metal sufficient to run a mold, but so slowly as to be of no practical value. Naturally the higher the sprue the speedier the flow of metal through the gates. A riser on the same level as the pouring sprue will overflow at the finish of hard pouring. The momentum of the metal carries it over. When no riser is attached this momentum is often sufficient to overtax the resistance of the mold and produce a strained casting. Metal suddenly poured down one sprue and up another will see-saw up and down and finally come to rest. The principle is identical with that of the pendulum which reverts to falling bodies. The momentum of the metal established by gravity carries the metal up and down until ultimately destroyed by friction and the resistance of the atmosphere to the moving mass of metal.

EFFECT OF LAWS OF MOTION

The laws of motion govern the force and direction of metal currents. Briefly these laws are:

1. Every body continues in its state of uniform motion in a straight line unless compelled to change that state by some external force.
2. Every motion or change of motion is in direction of the force impressed and proportional to it.
3. Action and reaction are equal and opposite in direction.

These laws have a practical application in every poured mold. Figure 34 shows a set of thin castings, four on either side of the gate and one on the end of the runner. This end casting will seldom mis-run if the metal is anywhere nearly right. The side castings, however,

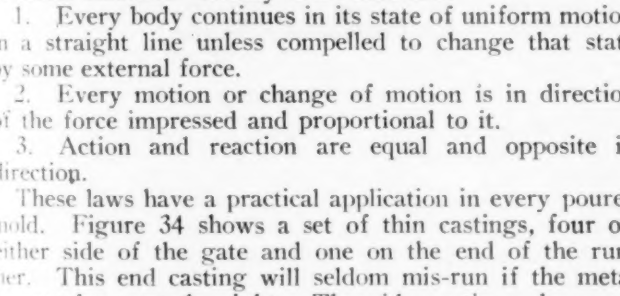

FIG. 34. A SET OF THIN CASTINGS

often fail to run. In pouring down the sprue onto the end casting the metal observes one resisting change of motion, vertical to horizontal direction. After that change it continues unopposed and in a straight line to the end casting and runs it. Between the pouring sprue and the side castings two resisting changes of motion are met cutting down the velocity and extending the time of running. These side castings are therefore more likely to mis-run because of these conditions of running.

The principle has a very practical application. In working loose pattern work, the castings most like to misrun should be placed at the end of the main runner or at the end of some runner most nearly in a straight line from the pouring sprue. If we curve the branch gate into the casting at say 60° to the runner gate, we invite the best chance of side running the castings because by practical manipulation that is the nearest to straight-line motion and least resistance. If this 60° branch runner be straight-line instead of curved line, we approximate the next best chance. If the angle be 90°, instead of 60°, or 150° instead of 90°, the chances of running the castings become relatively less, because in order illustrated (Gates "A," "B," "C," and "D" of Fig. 35) we deflect from straight-line motion and encounter increased resistance. Now if instead of rapid delivery of metal, we want quiet delivery, then the reverse order obtains. This reverse order is of practical value in gating against delicate mold parts as green sand pockets or cores. Often, to direct the current to a point beyond the gating point, thence backward to this gating point (D of Fig. 35) furnishes a

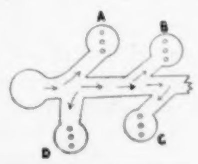

FIG. 35. CASTINGS SET AT ANGLES

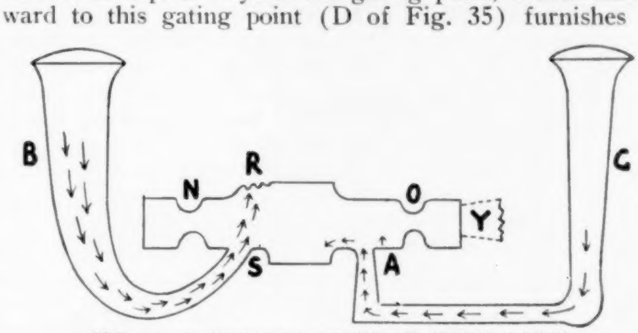

FIG. 36. DIFFERENT TYPES OF HORN GATES

very desirable relief of impact in the mold as compared to straight-line direction.

Between metal rounding a curve and metal striking off at a right angle lies a decided difference in velocity and momentum. To save the green sand levels at N and O of Fig. 36 against the impact of metal current from gate at Y, the horn gate B was used at S and the mold poured hard. The metal spouted up, struck the cope sand hard at R and tore and worked it away.

The modified form (C) of the horn gate was then used and found satisfactory, the difference being simply that between an angle and a curve of transit. Fig. 37 is another illustration. Gated straight in at point "A" with gate "AA" the green core "N" suffers hard impact while the first gate sweepings are carried by the metal current straight into the mold. If this gate "AA" enter at a

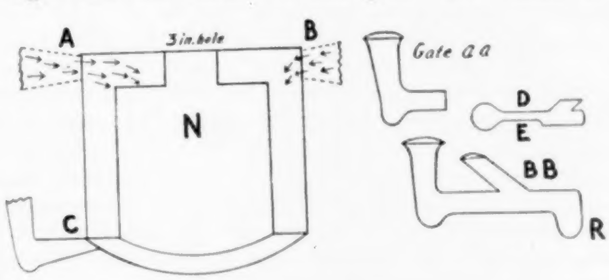

FIG. 37. GATING AROUND A CORE

tangent the core will get relief though the metal current and its sweepings will remain unchanged. Now, if we gate at "B" with gate "BB" backing into the mold at a tangent, the current into the mold is then curbed and the core relieved while gate sweepings are carried to

pool "R" of the gate and held there. Gated at the bottom as with gate "C" entering at a tangent approaches more nearly the ideal delivery. This ideal can be practically reached by using the fountain type "Y" gate as illustrated by gate "C" in Fig. 37. Incidentally if a section of the skim gate interposes the pouring sprue and the gating point as at point "E" in cross section "D," a broken current and a favored core results.

A very common fallacy indulged in molding is the practice of inclining a mold to assist in running certain types of castings. The fallacy arises from the impression that metal will run down hill better than on the level or up hill. That is undoubtedly true but the further question arises. "What is the effect of inclining a mold on the partition of metal in the stream?" In running thin sections metal must be held together, and if for any reason parted, a subsequent coming together makes questionable the chance for a good union. The situation can be studied from Fig. 38, representing a thin strip 40 inches long, 3/16 inch thick by 2 inches wide. In Part A the metal poured on the level drops to point "B" of the sprue, tarries a second, is caught by the pressure of the rising sprue and is driven in body mass into the mold.

In part B, inclined, the metal drops to point C in the sprue, and is hurried into and down the inclined mold. But it does not go down in compact body mass, the pull of gravity down the incline tends to separate the mold stream and quotas of metal leading become separated from those following and form an imperfect reunion later. The one great trouble with pouring a mold inclined with gravity and from a standpoint of running a thin casting is the fact that it involves a pull away from the delivery supply of metal rather than a force binding to that delivery supply. In short, it favors partition. Part C represents a mold poured against gravity, the incline being very slight, just enough to generate a resistance sufficient to guarantee entirely against partition.

The author's experience with the last method has been

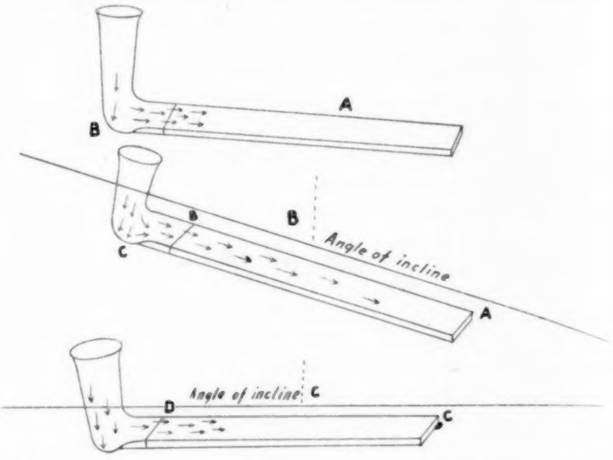

Fig. 38. Metal driven into a mold by gate pressure alone enters the mold in compact mass and is held together in running the mold. Sprue pressure is uniform throughout the mold. Metal entering mold inclined with gravity is subject to the pulling force of gravity in the mold, and responds to this influence toward metal partition in running the mold. Metal entering a mold slightly against gravity engages no possibility of partition and keeps in compact body mass. Sprue pressure decreases from "D" to "C"

very satisfactory and his practice is to pour either on the level or slightly against gravity; never the other way.

This series will be continued in an early issue.—Ed.

Casting Problems

Written for The Metal Industry by WILLIAM J. REARDON, Foundry Editor

White Metal Castings

Q.—We have a white metal consisting of 3% tin, 5% antimony and balance lead, and we would like to find out what agent is necessary to add to this molten metal that will make it pour and run freely into die castings and also into small ornamental iron moulds of various designs, lamp brackets, etc. We find the metal in its present state is sluggish and will not run freely.

We are also running zinc and find this also will not run in a pure state, so we would like to have the information as to what agent is necessary to make this zinc run freely.

A.—For your white metal, if you wish to continue using this alloy, we suggest you refine your metal by constant agitation. Get a few raw potatoes and put in a wire basket and insert to the bottom of the metal. The moisture they contain is emitted in the form of steam which causes continuous boiling. This process will eliminate the oxides and foreign matter in your alloy, and will cause the metal to run freely. A good flux to clean your alloy would be caustic soda, 3 parts; roll sulphur, 1 part.

We suggest, however, that you try antimonial lead. This metal contains approximately 12½% antimony, a small amount of copper and tin, and balance lead. It is cheap and has the advantage that it melts readily, cools rapidly and produces sharp castings.

In reference to your zinc, we suggest you try Horsehead. You will find it to run more freely. Anything added to zinc does not improve its casting qualities. However, ½% aluminum is permissible. Do not overheat, and use the best grade of zinc. Very little trouble is experienced in running castings in bronze molds.

Bronze Casting Molds

Q.—Will you please observe the three alloys used for making castings for what is known as bronze casting molds into which white metal is poured or die-cast.

No. 1. Copper, 83; tin, 2; zinc, 6½; lead, 8½. I have not tried this.

No. 2. Copper, 86; tin, 10; zinc, 2; lead, 2. Faced and drilled with difficulty—wore the cutting edge away fast but the casting had fine details and surface. Windsor Lock sand was used.

No. 3. Copper, 86; tin, 6; zinc, 5; lead, 3. Faced and drilled better than No. 2. Details and face were good but could be better. It may have been in the moulding.

If I can obtain the very best alloy then the methods of using it can be taken care of.

A.—Molds such as used in slush molding are usually made of bronze. Such metal as your No. 1 and No. 3, called brass, are sometimes used, but are not sufficiently hard and fractures easily when the mold is hot. The alloy used principally consists of copper 88, tin 10, lead 2. This is a hard dense metal, resists the continuous heating of the mold and retains its shape.

In making castings in bronze molds, the mold is heated to a point a little lower than the metal that is poured into the mold. This is accomplished by a blow pipe. Then after filling the mold with molten metal a few times, it is at the proper temperature for pouring. The correct heat of the metal and the proper venting of the mold are the factors influencing the character of the castings produced; also a bronze that will hold its shape and not fracture. We would suggest 88 copper, 10 tin and 2 lead as the best alloy.

Nickel Aluminum Bronzes

Written for The Metal Industry by E. D. GLEASON, Foundryman

Nickel aluminum bronzes should have a wide range of uses. An alloy of copper 88%; nickel 7%, manganese-aluminum alloy containing 25% manganese and 75% aluminum, 3%; 2% tin, gave the following physical properties:

Ultimate tensile per square inch, 89,500 pounds.
Yield Point per square inch 55,000 pounds.
Elongation in 2 inches 28 per cent.

This alloy is superior to phosphor, manganese and gun bronzes and special steels as set forth by the U. S. Navy on specifications for the inspection of materials in force October 1, 1917, as follows:

SAND CAST MATERIALS

	Yield pt. per sq. in minimum	Ultimate tensile strength in lbs. per sq. in. minimum	Elongation in 2 inches minimum
Monel	32,500	65,000	25%
Manganese bronze	30,000	65,000	20%
Gun bronze	15,000	30,000	15%
Steel, special	57,000	90,000	20%
Steel, class A	35,000	80,000	17%
Steel, class B	30,000	60,000	22%

The nickel aluminum bronze can be forged hot and is easily handled for melting under regular brass foundry conditions, either from the ingot or new metal. In making new metal, run down the copper and the nickel together under a good cover of borax glass then the manganese aluminum alloy. Stir well and add the tin last Owing to the great demand for high grade phosphor bronze for castings for government work, a demand should be created for nickel aluminum bronze in the place of phosphor bronze. The following tests of alloys made by A. Philip, Admiralty chemist, sets forth the comparison between the two:

VARIOUS BRONZES

Character of Sample	Copper per cent	Tin per cent	Phosphorus per cent	Zinc
1. Bearings	84.50	14.50	0.86	nil
2. Piston packing ring	85.60	10.85	0.82	2.74
3. Gear wheels	86.80	12.20	1.43	trace
4. Gear wheels	87.00	12.00	1.56	trace
5. Piston packing ring	87.70	10.70	0.97	nil
6. Bearings	88.90	10.15	0.82	nil
7. Bushings	88.90	10.30	0.77	nil
8. Castings	89.00	10.00	0.71	nil
9. Bearings	89.70	9.40	0.78	nil
10. Bearings	89.20	9.60	0.71	nil
11. Bearings	89.10	10.10	0.72	nil
12. Sheaves	90.40	8.96	0.73	nil
13. Worm wheel ring	94.20	4.90	0.96	nil
14. Worm wheel ring	94.40	4.80	0.98	nil
15. Worm wheel ring	95.50	4.95	0.95	nil
16. Worm wheel ring	95.20	3.82	0.86	nil

The above alloys have the following physical properties:

PROPERTIES OF THE ABOVE BRONZES

	Tensile strength lbs. per sq. in.	Elongation per cent in 2 inches
1.	17,382	1.0
2.	19,040	3.0
3.	30,000	4.5
4.	31,225	7.0
5.	51,968	6.0
6.	41,112	10.0
7.	42,560	12.0
8.	36,736	11.0
9.	45,248	12.0
10.	45,224	15.0
11.	40,444	11.0
12.	44,500	25.0
13.	56,000	28.0
14.	55,552	36.0
15.	55,000	34.0
16.	51296	43.0

In addition to the above, a typical phosphor bronze contains red ingot copper 75 pounds 15 per cent phosphor-copper 5 pounds tin, 10 pounds; lead 10 pounds.

Another alloy having copper, nickel and aluminum gave the following physical properties:
Ultimate tensile per square inch, 66,125 pounds.
Yield point in pounds, 30,000.
Elongation in 2 inches, 45%.

It contained 87 pounds copper, 5½ pounds nickel and 7½ pounds aluminum. The last alloy which is comparatively simple and easy to make, has physical properties that should recommend it in preference to others more complicated.

Coloring Nickel Silver

Q.—Can you give us any information on how to produce a dark brown, black or blue on nickel (German) silver? We have not been able to do this except by paints or enamel, which are liable to chip.

A.—Nickel silver is a difficult metal to color by simple immersion. It is possible that the well-known metal Lead Acetate-Hyposulphite Soda solution will give the desired results,

Try the following solutions:

Water	1 gallon
Hyposulphite of Soda	8 ozs.
Lead Acetate	4 ozs.
Sodium Carbonate	½ oz.

The solution should be operated at 160°-180° F.; the time of immersion to be the deciding factor for the colors you deside.

Presuming that you operate a plating department, black nickel solutions can be readily used to produce browns, blues and black colors upon nickel silver. These colors depend upon low voltage and amperage control. **Platers Wrinkles** will give you details for formulas for black nickel solutions under respective headings.—C. H. PROCTOR.

General Theory of Metallic Hardening

The theory of hardening by the binding of electrons at lattice discontinuities as proposed by Dean has been developed in considerable detail. In the discussion we have taken the position that this binding of electrons results in the formation of definite diatomic non-polar molecules. This assumption leads to a much simpler picture than we would obtain if we considered the change brought about by changing the interatomic distances as one of a general distortion of the electromagnetic field of the atoms in that vicinity.—R. S. DEAN and J. L. GREGG, Chicago, Ill.*

*Abstract of a paper read at the February meeting of the Institute of Metals Division, New York.

Testing Materials Society Meeting

A Report of the Group Meetings of the American Society for Testing Materials Committee at the Bellevue-Stratford Hotel, Philadelphia, Pa., March 15-18, 1927.

COMMITTEE A-5 ON CORROSION OF IRON AND STEEL (ZING COATED)

An important field investigation undertaken by the committee is now definitely under way at five localities, Sandy Hook, N. Y., Altoona, Pa., Pennsylvania State College, Pittsburgh, Pa., and Key West, Fla. The locations were chosen with the object of having varying atmospheric conditions, such as salt air, semi-industrial, rural, industrial and semi-tropical. At each site complete sets of zinc-coated sheets have already been installed, and coated wire fencing and general hardware and structural shapes which are normally exposed to the atmosphere are being collected and will probably be installed shortly.

Paralleling the field tests, the committee is studying methods of test which have for their object the detection of mechanical or manufacturing faults in the manufacture of zinc-coated products. The corrosion value of the coating will be developed so that it may be possible quickly to test a mill production upon purchase and give a line on its value in withstanding intended commercial service. The present work of the committee is of value in this respect since the accelerated tests will be made upon materials which are undergoing atmospheric exposure and in time it should be possible to draw a parallel in the accelerated and exposure results.

Aside from the tests in progress, the committee has formulated six specifications applying to zinc-coated sheets, line and fence wire and wire fencing. Recommendations have also been prepared covering specifications for the galvanized coating on pipe.

COMMITTEE B-1 ON COPPER WIRE

Committee B-1 on Copper Wire, at its meeting held at the Bellevue-Stratford Hotel, Philadelphia, March 17, took action to present for adoption as standard, revisions which were proposed tentatively at the last annual meeting, of the several specifications for bare copper wire to bring the basis of weight calculations into exact agreement with the statement of the international copper standard. A similar change together with certain minor corrections in the cross-section of the grooved and figure-8 trolley wire will also be made in the specifications for trolley wire which will then be identically the same as those of the American Electric Railway Association, with which the A.S.T.M. has been cooperating in the developing of the specifications for trolley wire. Cooperation will be continued with the A.E.R.A. on the development of Specifications for High Strength Alloy Trolley Wire.

COMMITTEE B-2 ON NON-FERROUS METALS AND ALLOYS

Committee B-2 at its meeting on March 16 at the Bellevue-Stratford Hotel, Philadelphia, took action on several new specifications which it will present to the Society this year, namely, new Tentative Specifications for Copper Tubing for Refrigerators, for Brazing Solder, for Yellow Brass Castings and for Strip Zinc. The tentative specifications proposed for strip zinc present some interesting new testing features, having reference to the bend testing of thin strip metal, particularly zinc, and other metals having low melting points, and methods and new equipment are outlined for accurate execution of tests of this sort.

Several important revisions in present specifications are being recommended, prominent among them being the revision of the present specifications for Non-Ferrous Metals for Railway Equipment. In its place will be presented two new specifications, one covering bronze bearings for locomotive wearing parts and the other, lined journal bearings. These specifications have been developed and revised as a result of cooperation with the appropriate committee of the American Railway Association. There will be a substantial revision of the methods of Chemical Analysis of Aluminum and Aluminum Alloys.

In addition, the committee is developing specifications for fire-refined copper, for manganese metal for use in the deoxidizing of non-ferrous metals and for silver solders. These specifications are not, however, in shape to be presented to the Society at its June meeting. The sub-committee on aluminum alloys has a very extensive research and testing program underway, covering the testing of aluminum die castings, which will comprise tensile, impact and hardness tests of some 70,000 specimens. This will probably be the largest program of physical tests on die castings that has ever been attempted.

The sub-commitee on sand-cast metals and alloys is continuing its extensive program of investigation of the art of testing non-ferrous castings, particularly in reference to the proper form of sand-cast test coupon.

A section of Sub-Committee VII organized to deal with aluminum die castings will be enlarged into a sub-committee of Committee B-2 to undertake work on die castings generally, including zinc, tin and lead base alloys.

DIE CASTING ALLOYS

During the past year Commitee B-2 on Non-Ferrous Metals and Alloys initiated work on aluminum die casting metals, placing the work in the hands of a section of its sub-committee on aluminum alloys. The work has assumed such proportions that a separate sub-committee has now been organized to cover die casting alloys in general, including zinc, tin and lead base alloys. A meeting of this new sub-committee was held in Philadelphia on March 18, under the chairmanship of Mr. H. A. Anderson, Bell Telephone Laboratories, Inc., New York City. During the past six months a list of the more generally used aluminum die casting alloys had been prepared. The values of various tests on specimens in evaluating the usefulness of these alloys for the manufacture of the castings in question was discussed and it was decided to make tension, hardness and impact tests on standardized forms of test specimens on twelve alloys. These specimens will be cast by some half-dozen leading manufacturers of die castings and will be tested in the laboratories of several large electric companies, automotive manufacturers and aluminum producers. It is expected that by means of such a test program the relative advantages of the various alloys as cast in the form of specimens will be determined and further, in time information will be accumulated which will serve to indicate how closely the test results on such specimens would represent the suitability of the various alloys for use in the complicated form of castings ordinarily made by the pressure die method.

Ordinarily die castings are economically justifiable only when a given part is to be used in large quantities. It is accordingly important that reliable information concern-

ing the strength, hardness and shock resistance of the alloy used be made available.

COMMITTEE B-3 ON CORROSION OF NON-FERROUS METALS AND ALLOYS

Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys, held a meeting on March 18 at the Be levue-Stratford Hotel, Philadelphia, at which it received the reports of its various sub-committees. The sub-committees on accelerated tests have made very definite plans to continue their work under accurately controlled conditions. Further total and alternate immersion tests will be carried out with definitely regulated quantities of aeration. The matter of the design of spray nozzle and the questions of standard spray box and air pressure have been given special consideration by the spray committee.

The sub-committees on long time exposure tests, in the atmosphere, in liquids, and under various galvanic and electrolytic conditions, respectively, have prepared a program which will extend over a period of years, and will, it is hoped, eventually furnish yard sticks which will aid in the interpretation of the various accelerated tests.

SECTION, COMMITTEE E-1 ON METHODS OF TESTING, ON TESTING OF THIN SHEET METALS

The Section on Testing of Thin Sheet Metals of Committee E-1 on Methods of Testing, has made substantial progress in its program of arriving at a standard method of tension testing of thin sheets. In its report last year it presented an extensive review of over 30 different tension test specimens in use. It also presentd conclusions on a preferred form of test specimen.

No criticisms of the conclusions then presented have been received and the conclusions have been substantiated by an extensive series of tests carried on during the year. The committee at its meeting held at the Bellevue-Stratford Hotel on March 17 had before it the results of tests on over 70,000 specimens of a number of materials including steel, copper, zinc, aluminum, brass, monel metal, phosphor bronze and nickel silver. As a result of its work the committee is now prepared to recommend a standard tension test specimen for use in testing thin sheet metals (ranging in thickness from 0.010 to 0.250 in.).

Making Brazed Tubing

Written for The Metal Industry by W. J. PETTIS, Rolling Mill Editor

Q.—We are interested in the process used for brazed brass tubing. Can you give us a description?

A.—Brazed brass tubes are made from brass strips, cut to form a tube, somewhat larger than the finished tube desired, and two or more numbers heavier than the finished gauge. For example, to make a 1" round brazed brass tube, with walls to gauge 16 B&S, a strip of brass 3¾" wide and about 12 to 14 B&S would be required. A ¼" tube would take a strip 1⅛" wide; the length of the strip based on the weight of the finished tube.

The first process consists of forming the strip into a tube. The modern way is to pass the strip through a forming machine, which consists of a series of rolls, that form the strip into a tube, an older method, but one that is still in use, is to form up the strip on a draw bench. The end of the strip is folded in the shape of a "cornucopia" about six inches long. This is placed in a die whose diameter equals the circumference of the strip, when formed in a tube and pulled through the die, and over a loose fitting "triblet." The tube is then straightened, by stretching on the draw bench. In either case an open stem tube is formed.

The edges are then brought together firmly, by wrapping with iron wire, at intervals of about one foot apart. A "V" shaped tool is drawn down the seam, making a slight depression and the tube is ready for brazing.

The brazing solder is an alloy consisting of 50% copper, and 50% zinc, finely ground. This is mixed with borax and slightly moistened. A small quantity is placed in a container with a funnel-shaped mouth, and is drawn along the seam of the tube, depositing the solder along the same. This calls for some skill on the part of the operator, as the solder must be evenly distributed. The tube is now ready for the brazing furnace.

This is a tunnel shaped furnace approximately two feet long, with an opening about 8" square, and is fired with either gas or oil. The flame enters at side near the top, being deflected by baffle walls and it comes down towards the bottom of the furnace.

Benches are placed at either side of the furnace opening on a level with the bottom. The brazer places four or five tubes on the bench, directly in front of the furnace opening, and with the aid of small hand tongs moves the tubes forward in the furnace, with the solder side up, directly under the flame. These are allowed to stand only long enough for the solder to become molten, and are then moved forward again, until the tube has been through the furnace. They are taken out by the brazer's helper, on the other side of the furnace. He removes the wires, while another batch is coming through. The pauses are very slight and the operator has only his eye to aid him in telling when the solder is sufficiently molten to make a perfect braze. If the tube is left an instant too long under the flame not only will the solder melt but the tube as well.

The metal used for brazed tubing is generally an alloy of 70-75% copper and 25-30% zinc. The high copper content is necessary in order to have the solder melt while the tube is about cherry red, thus assuring a joint.

The tubes are inspected and all lumps and rough spots on the brazed seam are removed by filing. The tubes are then ready for the draw benches, and are finished in two to three draws, the same practice as used in drawing seamless tubes.

Soldering Wire to Brass Plate

By P. W. Blair

Q.—We are working on a problem which requires the rapid soldering of a nickel-iron wire to a brass plate. If you have any information which would help us out on this problem, we would appreciate it.

A.—As it is probable that you are to use these parts in electrical work, a good flux to use where an acid flux is objectionable is a simple mixture of rosin in alcohol. Take a pint of industrial or other alcohol and dissolve in it about ¼ lb. of rosin.

Not having a sample of the pieces to be soldered, we cannot give you any definite information, or method of soldering in a rapid manner. The most rapid and permanent method is with the blow torch on large work and the electric iron on small work.

The nickel-iron wire should have a coating of tin applied where it is soldered to the brass plate. This can be accomplished by immersing the wires in loose bunches to the desired depth in a molten pot of clean molten tin.

British Institute of Metals Meeting

Abstracts of Papers Presented at the Annual General Meeting, Held in London, England, March 9-10, 1927

Investigation of the Effects of Impurities on Copper. Part V.—The Effect of Bismuth on Copper. By Professor D. Hanson and Grace W. Ford.

This paper describes experiments made on copper containing up to 0.1 per cent of bismuth, and the effects of small quantities of bismuth on the casting, hot-and cold-rolling, mechanical properties, electrical conductivity, and microstructure of copper.

The experiments confirm the great embrittling effect of bismuth, and indicate that when more than a trace of bismuth alone is present in copper, the working properties, particularly the cold-working properties, are seriously affected. The solid solubility of bismuth in copper has also been investigated.

Investigation of the Effects of Impurities on Copper. Part III.—The Effect of Arsenic on Copper. Part IV.—The Effect of Arsenic Plus Oxygen on Copper. By Professor D. Hanson and C. B. Marryat.

These sections describe investigations into the effects of arsenic alone, and of arsenic plus oxygen on copper. The tests described in Part III have been made on a series of alloys containing up to 1 per cent. of arsenic, and the paper describes the effects of arsenic on the casting and working properties of these materials. Tests have also been made on the mechanical propertis—tensile tests at ordinary temperatures and at 250°C., hardness tests, fatigue range, and notched-bar impact test; while the effects of arsenic on the electric conductivity, both at 20°C. and 65°C., have also been examined. The effects of arsenic on the microstructure and microstructure of copper have also been determined, and the solubility of arsenic in solid copper has been investigated.

In part IV a similar series of tests has been carried out on copper containing up to 2 per cent. of arsenic and 0.1 per cent of oxygen, with a view to ascertaining the influence of each of these elements is on the presence of the other. In particular, the influence of arsenic in modifying the cold-shortness of copper containing oxygen has been investigated.

Experiments on the gassing of copper by hydrogen have also been undertaken with a view to ascertaining the influence, if any, of arsenic on the gassing of oxygen-bearing copper.

Brittleness in Arsenical Copper. By Clement Blazey.

A description is given of a type of brittleness in arsenical copper tubing developed by annealing in the temperature range 450° to about 650°C. The susceptibility to brittleness was inherent in the "ascast" billets from which the tubes were made, and no alteration in hot and cold working methods could eliminate it. The degree of susceptibility varied from billet to billet, but the variation could not be connected with chemical composition. After remelting, no trace of brittleness could be developed. Over a period of several years the brittleness was encountered in a certain mill on three occasions, and appared to be connected with the composition of the refinery charges and with melting operations.

Electric Furnaces in Non-Ferrous Metallurgy. By D. F. Campbell.

This paper deals in a practical way with the principal electric furnaces now used for melting alloys of copper, nickel, zinc, and silver, with special reference to induction furnaces of normal and high-frequency.

The Penetration of Mild Steel by Brazing Solder and Other Metals. By R. Genders.

The cracking of mild steel under slight stress when heated and wetted with brazing solder is due to rapid intercrystalline penetration of the steel by the brass. Copper behaves similarly to brass, but zinc, tin, and lead-tin solder have no perceptible action. The behavior of mild steel in comparison with that of other metals when stressed and exposed to corrosive media is considered. It is suggested that the phenomenon of intercrystalline penertration is in many cases of a complex character, involving a third factor.

The Penetration of Brass by Tin and Solder. With a Few Notes on the Copper-Tin Equilibrium Diagram. By H. J. Miller.

The cracking of stressed brass articlee by a process of intercrystalline penetration when in contact with molten solder of the tin-lead variety is associated with the phenomenon of "season-cracking" and the penetration of mercury into brass. Tensile tests upon brass test-pieces which are surrounded by various molten metals and solders indicate that the stress required for penetration to take place is much higher than that required for the penetration of mercury; experiments with stressed brass tubes also indicate that high stresses are required for penetration to take place.

Some subsidiary experiments with copper-tin alloys indicate that the eutectic composition of the series occurs with about 0.7 per cent of copper as against 1 per cent by Heycock and Neville, 2 per cent by Guertler, Shepherd and Blough, and 5 per cent by Giolitti and Tavanti.

The Attack of Molten Metals on Certain Non-Ferrous Metals and Alloys. By Harold J. Hartley.

The attack of molten tin and tin containing solders upon brass and copper have been studied, taking the time factor into consideration. Penetration of the molten into the solid material occurs when the latter is stressed in tension. Fully annealed materials are attacked at very low stresses with ultimate breakdown.

Notes on the Manufacture and Properties of Hairsprings. By H. Moore and S. Beckinsale.

The function and essential properties of hairsprings and control springs are discussed. The respective merits and disadvantages of steels, ferrous alloys (e.g. Elinvar), and non-ferrous metals and alloys as hairspring materials are indicated. To raise the elastic limit to the required degree, hardening by heat-treatment or by cold-working is necessary, but all hardening operations are liable to produce a state of imperfect elasticity detrimental to the spring. The use of low temperature heat-treatments to restore elasticity after cold-working (drawing, rolling, and the coiling of the spring) is described. Steel hairsprings are subject to corrosion, but Elinvar is highly resistant. Some details of the manufacture of phosphor-bronze and other hairsprings are given, and the selection of material for hairsprings required to have a low electrical resistance is discussed.

The Application of Strain Methods to the Investigation of the Structure of Eutectic Alloys. By F. Hargreaves.

Investigation of the lead-tin, tin-zinc, and copper-silver eutectics shows that straining by suitable methods results in markings due to slip, similar to those which occur

in the case of pure metals. The orientation of the lead-tin eutectic is apparently determined by that of the tin.

Note on the **Crystallization of the Lead-Tin Eutectic.** By F. Hargreaves.

Straining and etching methods applied to a 30-lb. ingot of lead-tin eutectic show the exterior to possess the largest crystal size with absence of distinct colonies. The middle consists of much smaller crystal units in the form of distinct colonies of coarser eutectic structure.

The **Influence of Calcium on Aluminum Containing** Silicon. By J. D. Grogan. **With an Appendix on the** Estimation **of Calcium in Aluminum Alloys.** By P. G. Ward.

Calcium combines with the silicon present in commercial aluminium, forming a compound probably, $CaSi_2$. This compound is almost insoluble in solid aluminium at all temperatures and exerts no age-hardening influence. By removing silicon from solid solution in aluminium calcium improves the electrical conductivity of the latter.

Note on the Magnesium-Rich Magnesium-Copper Alloys. By M. Hansen.

The paper contains the results of investigation of the solubility of copper in solid magnesium and the mechanical properties of some magnesium-rich magnesium-copper alloys. Some indication of the phase boundary of the solid solution of magnesium with copper has been obtained. The microstructure of quenched and slowly cooled alloys is illustrated by means of photographs. The quenched alloys show no perceptible hardening by aging. Some mechanical properties of extruded material both with and without heat-treatment are given.

The Mechanism of Inverse Segregation in Alloys. By R. Genders. **With an Appendix on the Accurate Determination of Copper in Bronze by Electrolysis.** By R. A. F. Hammond.

The hypotheses put forward to account for the occurrence of inverse segregation in alloys are critically discussed. None is fully in accordance with experimental fact, and it is evident that some factor is involved in the phenomenon, the influence of which has not yet been taken into consideration. Preliminary experiments are described showing that, in extreme cases of inverse segregation, exudation at the surface of the casting occurs simultaneously with the escape of evolved gases. The variation of composition in chill-cast slabs of bronze containing 5 per cent tin made by various methods of casting were determned. The previous work of the author on the flow taking place in the mould during the formation of the ingot is considered in relation to these results. A general theory of inverse segregation is advanced, in which the gas constituent in alloys is considered as part of the system. The evolution of gas from solution in the metal is regarded as of primary importance in determining variations in composition in the solid casting. Representative experimental data are explained by means of the theory, and methods of avoiding inverse segregation are discussed.

Magnetic Analysis as a Means of Studying the Structure of Non-Magnetic Alloys. By Professor K. Honda and Professor H. Endo.

The present investigation is to show by means of examples that magnetic analysis applied to the case of non-magnetic elements, which are paramagnetic or diamagnetic, affords a very convenient method of studying the equilibrium diagram for the alloys consisting of these elements. Not only is the melting point or the transformation point of an element given by a sharp discontinuity of the susceptibility-temperature curve, but the liquidus and the solidus of an alloy are also marked by a sharp break or bend in the same curve. In some cases, small solubility is marked by a very large abrupt diminution of the diamagnetic susceptibility of one component on adding a small quantity of the other. The magnetic analysis is also a very convenient method for the study of the actual state of an alloy when above its melting point, that is, in detecting the existence of an intermetallic compound in the liquid phase, the degree of dissociation of the compound with the rise of temperature, etc.

An Etching Reagent for Copper. By Professor B. W. Holman.

The Note describes the use of silver nitrate as an etching agent for copper, and suggests its utility in research work. The intricate etching figures sometimes produced by this method are commented on. (Cf. J. Inst. Metals, 1926, 35, 363-370).

Examination of a Fifteenth Century "Brass." By J. Newton Friend and W. E. Thorneycroft.

A brief account of the tomb of Richard Beauchamp at Warwick, and an analysis and micrographs of portions of the bronze statue are given.

Note on the Silver Contents of Roman Lead From Folkestone and Richboro Castle. By J. Newton Friend and W. E. Thorneycroft.

Specimens of Roman lead from Folkestone and Richboro Castle have been analised. The former contained 0.0072, and the latter 0.0078 per cent of silver.

Brine Resisting Solder

By Jesse L. Jones, Metallurgical Editor

Q.—We have difficulty in getting a solder that will withstand the action of calcium chloride brine. The ordinary solder seems to be acted upon by the solution and will not hold for more than a year before it begins to weaken. Can you suggest a formula for this purpose? This solder would have to be used on German silver also, as that metal is often used in manufacturing ice cream machinery. We mention this because we have difficulty in using the ordinary solder on that metal. Is there a commerical product on the market that will do this work?

A.—Where metals are soldered together that form a galvanic couple there is no solder that will resist an electrolyte like calcium chloride brine. Silver solder resists corrosion tolerably well and it is used to a considerable extent for soldering nickel silver. If soft solder has to be used, wiping solder (tin 33⅓, lead 66⅔), would probably withstand corrosion better than commercial ½ and ½ solder (tin 50, lead 50).

Expansion of Metals

By Jesse L. Jones, Metallurgical Editor

Q.—What metals have the greatest expansion?

A.—Aluminum, cadmium and zinc are among the more common metals having a high expansion. Rolled yellow brass is used as the high expansion metal in bimetallic couples in connection with Invar as the low expansion metal.

Roberts-Austen on pages 78 and 79 of Introduction to Metallurgy gives the following coefficients of linear expansion:

Aluminum	0.0000231
Bismuth	0.0000162
Cadmium	0.0000306
Copper	0.0000167
Lead	0.0000292
Magnesium	0.0000269
Potassium	0.0000841
Sodium	0.0000710
Tin	0.0000223
Zinc	0.0000291

A New Rust-Proof Black Finish for Iron and Steel

A Complete Description of a New Method of Preventing Atmospheric Corrosion. From The Monthly Review, February, 1926

By CHARLES H. PROCTOR, Plating-Chemical Editor

In the production of rust proof black finishes upon iron and steel by heat methods, the Bower-Barff, Bradley, Bon Tempi and Gesner methods are used to a greater or less extent. They are all based upon the patents of Bower and Barff, granted in 1857, and consist essentially of heating iron and steel in a closed retort to cherry red at about 1200 deg. F. Then super-heated steam is injected into the retort, which finally results in the formation of an adhering and penetrating coating of black magnetic oxide of iron, when the surface is finally protected with an oil such as linseed oil and dried thoroughly a rust resisting black finish results.

The Bradley, Bon Tempi and Gesner patents are essentially a modification of the Bower-Barff process, a hydrocarbon such as benzine or gasoline being injected with the steam. The patentees claimed much superior results to that obtained by the Bower and Barff method. This decision is still an open question, and debatable.

In hotels, the Bower-Barff finish plus later modifications, is used extensively upon builders' hardware and results in a very lasting finish, unaffected by oxidation and atmospheric rust. There are only three or four nationally known builders' hardware manufacturers who produce this finish in America.

The Parker process is quite extensively used as a black rust proof finish. This process is based upon the original patents of Coslett and Richards of England. One of the original patents of Coslett expired last year, so is now public property.

I have developed a rust proof black finish for steel that is very simple of application. The method can be installed in any plating department that must produce rust-resisting finishes upon steel or iron. The basic idea is not new because three years ago I presented a paper at an educational session of New York Branch entitled, "The Production of Imitation Silver Deposits by the Aid of Zinc Cyanide Deposits and Antimony Oxide." This original paper, then, was the basis for what I am pleased to term a new rust proof black finish. The details of the production of the finish are as follows:

PROCESS FOR PRODUCING A RUST PROOF BLACK FINISH UPON ZINC PLATED STEEL SURFACES

Part No. 1—

The steel articles to be zinc plated must be clean from grease, oils, etc., and free from rust and scale. The usual procedure in cleansing steel goods for plating can and should be adhered to.

Part No. 2—

The articles should then be immediately plated in the Duozinc Cyanide solution.

Water	1 gallon
Cyanegg	4 ounces
Zinc Cyanide	4 ounces
Caustic Soda	4 ounces
Cyanobrite	1/8 ounce

E. M. F. 5 to 6 volts. Amperage 25 S. F.

Minimum Temperature 110/120° F.

Anodes Duozinc Electrolytic Zinc 2% Mercury.

Time of Plating, 10 minutes minimum.

Part No. 3—

Immediately after Duozinc plating, wash thoroughly in cold water, then immerse in the following solution for a moment:

Water	1 gallon
Caustic Soda	4 ounces
White Powdered Antimony Oxide	1/2 ounce
Temperature 120/140° F.	

A dead black adherent coating will result. Remove from the solution quickly, then wash in cold and boiling water and dry with heat.

The black coating should be protected with a thin coat of lacquer (air drying).

Black Nubelac N. L. L.—2050 B. and Nubelac Thinner N. 331 in proportion of 3 parts to 1 part lacquer is an excellent protective coating. The Nubelac products are manufactured by the Nubian Paint & Varnish Co., Chicago, Ill.

We have found that Benzole colored with Nigrosine Black (Benzole Soluble) and a small amount of a cheap furniture varnish to obtain an adherent mixture will answer the purpose. This mixture should not cost more than 40 cents per gallon.

Any cheap air drying black mixture can be used or any form of black lacquer commercially advertised.

The use of antimony solutions in the coloring of metals is nothing new. I have advocated them in one form or the other for years. Hiorns, in his splendid work entitled, "Metal Coloring and Bronzing," published in London in 1892, gives considerable detail covering bronzing and coloring of various metals with antimony chloride and hydrochloric acid and antimony sulphide, and sodium hydrate. See pages 213 and 234. In the same work a formula is mentioned on page 212, due to Botteger an authority on electro-plating and metal coloring covering sodium hydroxide, mercury and antimony chloride. "Duillo," on page 234 of Hiorns' work, mentions an antimony solution for producing a black color upon zinc which requires an oil or varnish to protect the black, or it will rub off. There exists a U. S. patent, No. 1,436,729, dated November 28, 1922, for black coatings upon zinc prepared from water 150 gallons; sodium hydroxide 76% 2 pounds, butter of antimony 1 pint. The solution must be heated to 212 deg. F. Prior art was established by Hiorns in 1892 for coloring zinc black with antimony salts and sodium hydroxide solution. Therefore, in my opinion, the patent referred to is invalidated and the writer does not consider in presenting this paper that he infringes upon any existing patent.

The solution I have advocated to produce the black finish upon the zinc plated surface, acts instantly and is adherent. Tests made with steel automobile rims finished by the process and without the final coat of protective black lacquer or other medium in the testing department of one of the largest automobile rim manufacturing plants in the United States, have found that the rust-resisting qualities of a regular zinc plated steel rim, plated in the Duozinc cyanide solution has been increased from the normal 48 to 60 hours salt spray test, using the regular 20 per cent salt spray test, to 120 hours or more, or an increase in resistance to corrosion and rust of more than 100 per cent. With the application of the final coating of black lacquer or similar protective coating for the black finish, the corrosion resistance would be further increased.

Electrodeposited Coatings for Prevention of Corrosion

A Paper Read on January 19, 1927, at the Meeting of the Electroplaters' and Depositors' Technical Society, at the Northampton Polytechnic, Clerkenwell, England—Conclusion*

By H. SUTTON

ELECTRODEPOSITED CHROMIUM

Although much interest has centered round chromium deposits in recent years, the present indications are that chromium is much inferior to zinc and cadmium for rust-proofing iron and steel.

In the author's experience deposits of 0.0015 in. to .0025 in. thickness obtained from Sargent's[5] bath direct on steel gave poor results in sea-water tests. Severe pitting of the steel occurred at points over the surface, indicating local attack of the type experienced with nickel deposits, but in a more acute form. Recent remarks of other investigators confirm this experience. On the other hand, the remarkable properties of chromium deposits in regard to resistance to tarnish, and to mechanical abrasion will undoubtedly render them of practical value, and if deposits on brass and copper prove to give reasonable protection against corrosion, considerable developments may be anticipated.

While electro deposited chromium appears at present to be less efficient than zinc and cadmium for protection of iron and steel against severe conditions, the coatings deposited on highly-polished surfaces retain their reflectivity extremely well on account of the resistance of the metal to atmospheric corrosion, and in a manner which promises to be of value in particular instances.

TIN AND LEAD

Electrodeposited coatings of tin and lead on iron and steel have not proved efficient means of protection against corrosion in marine atmospheres, but they have been of use in the case of parts which have to be exposed to various chemicals, e.g., explosives, and for a variety of purposes in which special conditions have to be met. Tin coatings on copper have also been used successfully.

On iron and steel the less active nature of tin and lead causes severe corrosion at parts where the underlying metal is exposed to sea-water, either by defects or porosity in the coating or by scratches.

INFLUENCE OF PLATING OPERATIONS ON MECHANICAL PROPERTIES

It is well known that the application of zinc by the hot-dip process and by processes of the "Sherardizing" type influences the mechanical properties of steels, particularly those of hard drawn and of heat-treated steels in high-tensile condition, owing to the tempering effect of the temperatures employed.

It is frequently stated, in error, that the mechanical properties are not influenced by electro-zincing. It has been shown that zinc-plating operations may be accompanied by an embrittling effect on the underlying steel, but in general the brittleness can be removed satisfactorily by heating the parts after plating[6]. For zinc deposits up to 0.0005 in. in thickness the author found that heating to 100° C., e.g., by immersion in boiling water, removed the brittleness satisfactorily from cold-drawn steel wire.

The embrittling effect of plating operations is not confined to zinc, but appears to be of fairly general occurrence. Further, considerable embrittling of steels may result from pickling operations preparatory to plating.

*Part 1 was published in our issue for March, 1927.
[5] Sargent, Trans. Am. Electroch. Soc. 37, 479 (1920).
[6] Sutton, Trans. Faraday Soc., Vol. 21, 1925.

It is, therefore, advisable to heat zinc-plated steel parts, especially those made in medium and high tensile steels, to a temperature of at least 100° C. for a period of half-an-hour after plating. This treatment does not impair the protective qualities of the deposit, but tends to improve them. In the author's experience, only by adoption of this procedure was it possible to plate steels with zinc without some detriment to the mechanical properties.

In conclusion, the author would like to thank the Director of Scientific Research, the Air Ministry, for permission to present this paper.

DISCUSSION

MR. WERNICK (London): Mr. Sutton has presented an informative paper on a very important subject. Plating for rust resistance is receiving closer attention as time goes on, and buyers of plated ware are no longer content with a deposit which looked good: it had in addition to give good service for a reasonable period of time. The time was approaching when the bulk of plated goods would be sold on a definite guarantee of durability specifying rust resistance for a given period.

The lecturer appears to have obtained some very good deposits of zinc from what appears to be a very simple bath (merely a concentrated $ZnSO_4$ solution). Generally such a bath gave a dark, markedly crystalline, and usually porous deposit. I have tested sulphate deposits for corrosion resistance, and found that the deposit has only lasted a matter of days rather than months, but my tests have been conducted under severe tropical conditions. In this connection, it would certainly seem advisable to devise some standard corrosion test which different investigators could use in common and so obtain comparable results.

Zinc obtained from a zinc cyanide bath was undoubtedly superior to that from the sulphate bath, an important factor being the unquestionable superiority in throwing power of the former bath. For work containing right-angled bends, the sulphate bath was almost useless. A lot has been written on the protection afforded by zinc due to its position in the electro-chemical series, even when the iron was exposed, but there was a limit to the amount of iron which could be safely so exposed; although a certain amount of zinc does deposit on right-angled bends from the sulphate bath, this is small, and the iron is soon exposed and rusting invariably commences at such points.

It is doubtful whether the tables (culled from Bablik's book), showing the rate of solution in weak acid of different zinc coatings, give a true estimate of the relative protection afforded by these coats. I have found that a treatment amounting to a sherardized coat, but containing a proportion of cadmium with the zinc, has shown superior rust resistance even to cyanide zinc. Incidentally, this hardly confirms the statement that impurities lessened the rust-resisting properties of the zinc, since the cadmium present in this case had actually increased it.

In regard to the embrittling effect of zinc on springs, I have experienced the same thing with nickeled and electro-tinned springs. The trouble was supposed to be due to occluded hydrogen, and this would be supported by the way in which Mr. Sutton had got over the difficulty. I have found, however, that this embrittling effect passes off in time spontaneously, possibly due to the gradual escape

of the occluded gas. A rough measurement of the brittleness of the spring was periodically made, and this was progressively found to decrease until it had almost disappeared in about 18 days.

THREE-PLY PROCESSES

J. A. BEVAN (London): This matter of corrosion and protection from corrosion by electro deposited coatings is very important. Man coats one metal with another to protect it from rusting, and nature immediately sets to work to destroy what man has set up. When zinc is deposited on iron, the zinc acts as anode, and the iron as cathode, hence we say zinc protects the iron. If, however, nickel or copper is deposited on iron, then the iron becomes anode and the other metals cathode, and they do not afford any protection to the iron, unless the coating is continuous and non-porous;—using zinc or cadmium as an undercoat (apart from various process difficulties) rather than affording protection, even promotes corrosion. We all know that a nickel deposit on steel suffers from defects, such as pits and cracks and the various other troubles, all of which have been discussed at our meetings, and it seems that our research must be directed towards obtaining a perfect deposit, but at present we have not got it. The most successful method we have is the so-called three-ply process, which consists of a nickel deposit on the steel followed by a copper deposit on the nickel and then a nickel deposit on the copper. Anyone conversant with workshop practice knows the great difficulty in guarding against dust, etc., getting into the solution, and we all know that it is mainly due to this that we cannot obtain a perfect deposit, and it is only by a perfect deposit that we shall obtain any protection against corrosion.

CADMIUM AND CHROMIUM

W. JAMES (London) states that as a result of his membership of the Society he had added two new solutions at his works—a chromium bath and a cadmium bath. He exhibited samples of cadmium plated steel which he had subjected to various tests, and he felt that few would disagree with him when he said that Cadmium had undoubtedly protected the steel from corrosion, and it was remarkable that the deposits were of only three minute duration, and even in places where he had ground the deposit off the cadmium had offered a considerable amount of protection. A chromium-plated cycle part, which was exhibited, had been hanging in his acid dipping shop for several months, a very severe test; he would call attention to the fact that the polished portion showed practically no tarnish or corrosion; he would like to ask why the polished metal was less attacked than the unpolished portion. This cycle part (a seat pin) had been plated by a fellow member, Mr. Ollard, and undoubtedly showed the non-tarnishing qualities of chromium plating under very severe conditions.

E. A. OLLARD (London) said that the cycle part exhibited by Mr. James, whilst giving a good example of the non-tarnishing qualities of chromium, must not be taken as an example of a protective coating on steel against corrosion, for it had been anodically treated in pickling, nickelled, and coppered, and the copper polished, and the chromium deposited on the polished copper. The fact that a polished surface resists corrosion better than a matt surface is well known, and due to the fact that moisture, etc., cannot cling to a polished surface like it can to a matt surface. Mr. Ollard said he felt that Mr. Sutton's zinc plating was of a far superior quality than that generally turned out of the plating shop, for there was no doubt that cadmium deposits are usually far superior to zinc deposits, and cadmium-plated steel withstands atmospheric corrosion better than zinc-plated steel. He would like to ask Mr. Sutton if he has had any experience of the zinc-mercury deposits which had received considerable attention in America. The reason that electro-galvanizing has not become popular is due more to the conservative methods of consulting engineers than to the relative values of the two zinc coatings. When he had suggested that electro-galvanizing was more suitable for a job than the hot galvanizing he had invariably been met with the retort that it was quite possible, but the consulting engineers had especially specified hot galvanizing. It was obviously necessary to educate the consulting engineers as to the merits of electro-coating against the hot coatings.

AMERICAN EXPERIENCES

C. H. HUMPHRIES (Indianapolis, Ind., U. S. A.) said that he would like to endorse what a previous speaker had said about obtaining certain definite standards as regards electro-deposition coatings. In the past the amount of metal deposited was generally left to the caprice of the individual plater; with a result some coatings are suitable, some are not. In the States they are making certain standards, and plated goods have to stand up to definite tests.

The character of the deposited metal depended very much upon the solution used; the temperature and current density played an important part. There was a considerable difference between zinc deposited from a zinc cyanide bath and zinc deposited from a sodium zincate bath. With cadmium, exceedingly small quantities of other metals in solution act as distinct poisons; for instance 0.001 per cent. of thallium is sufficient to materially alter the character of the deposit; small quantities of lead also make their presence felt. It has been found that a 0.0002 in. (thickness) deposit of cadmium is equal to a 0.0005 in. deposit of zinc.

Soldering Britannia Metal

By P. W. BLAIR, Mechanical Editor

Q.—In the manufacture of some of our products, it is necessary to solder a slush-molded Britannia metal handle to cold rolled steel having a heavy coat of zinc plate. We have tried out various fluxes and soft solder but have been able to find none that gives satisfactory adhesion to both the Britannia and the zinc plated metal. Can you recommend a soft solder and a flux for same which will work satisfactorily on the materials?

A.—Fine solder is generally used for soldering Britannia metal. A small percentage of phosphorus renders soft solder very lively; that is the solder has a tendency to run freely. Too much phosphorus, however, is injurious and if added to the solder, it should be in the form of phosphor tin. One or two ozs. of 5% phosphor tin to 100 lbs. solder is generally sufficient to obtain the desired results.

Consult the advertising pages of THE METAL INDUSTRY for soldering flux manufacturers. Hydrochloric acid is the best for galvanized steel and Gallipoli oil for Britannia metal.

We would suggest that you pre-heat your rolled steel parts before soldering.

Satin Finish on Nickel Plated Die Castings

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

Q.—We are sending you by parcel post, a die-cast wing casting which has a dull satin finish nickel plate. We are interested to know what solution could be made that would produce this finish.

A.—To produce a similar dull satin finish upon all castings proceed as follows:

1. Cut down the surface; then satin finish it with the finest of glass sand or use a satin finishing brush.
2. If a sand blast is used then it is advisable to cleanse the tripoli or other cutting down material from the castings first, with benzine, gasoline or heated kerosene.
3. After sand blasting then cleanse in a very mild alkaline cleaner. The die castings should not darken to any extent. Then wash thoroughly in water and plate direct in the following solution:

Water	1 gallon
Single Nickel Salts	10 ozs.
Nickel Chloride	1 oz,
Boracic Acid	1 oz.
Ammonium Chloride	1 oz.
Cadmium Chlodide	1/64 oz.
Epsom Salts	12 ozs.

To prepare the solution dissolve all the salts except the Epsom Salts in half the water at 180° to 200° F. Then add the balance of the water cold. Finally add the Epsom Salts with constant stirring. The temperature of the solution should be maintained at 80° F. voltage 3 to 5; anodes cast or rolled nickel 97-99 per cent. Avoid using an excess of current so as to prevent burning.

An important factor to prevent staining is the drying out. It is best to rinse only in cold water. Then air dry by a blast of air from an electric fan or the final drying may be by the aid of denatured alcohol.

If a final finish is to be resorted to after nickel plating then use a tampico wheel with kerosene oil and pumice stone.

4. As the final cleanser to remove the kerosene and pumice stone use a hot solution composed of

Water	1 Gallon
Tri-Sodium Phosphate	2 to 4 ozs.
Soda Ash, 58 per cent	2 to 4 ozs.

5. Finally dry out carefully as outlined.
6. The cadmium chloride mentioned in the nickel formula is the brightening agent. When the nickel deposit becomes dull make an addition of half ounce per hundred gallons of solution as required.

ADDITIONAL DATA

It is possible that to produce identical results with the sample submitted the die casting surface will have to be treated as follows.

1. Sand blast the wing parts of the radiator cap. After cutting down with tripoli, polish the other section.
2. Cleanse with alkaline cleaners. Wash thoroughly.
3. Plate in nickel solution outlined for 5 minutes or more, then wash thoroughly in water.
4. Plate in an acid copper solution direct, prepared as follows:

Water	1 gallon
Copper Sulphate	24 ozs.
Sulphuric Acid	8 ozs.
Yellow Dextrine	1/8 oz.
Temperature	80° F.
Voltage	1 to 2 volts.

5. Plate for fifteen minutes then acid dip the copper deposit in a bright acid dip.

Sulphuric Acid	2 parts
Nitric Acid	1 part
Water	1/2 pint per gallon

of mixed acids.

Use only when cold and keep the receptacle surrounded with running water.

6. The acid dip will produce an ormolu or dead satin finish, wash thoroughly, rinse in cold soap solution and boiling water. Then polish the edges of the wings to a lustre and then recleanse and nickel plate for a satisfactory period, say 20 minutes.

Pumice stone should be incorporated with tallow when brushing nickel plated parts to a dead lustre with tampico wheels. Kerosene is applied to the tampico wheel to keep the tallow soft.

This additional data is given you to be used if the first methods do not produce a finish equal to the sample submitted to us.

Black on Silver

By CHARLES H. PROCTOR

Q.—I have a large number of electrical fixtures to silver plate. They are of a very fancy embossed type and all inlaid parts are to be finished in a dead black.

After silver plating we sprayed the necessary parts with black lacquer, wiping off the high-lights with lacquer thinner. We found this very unsatisfactory as it was impossible to keep from wiping in the background. Also, the time spent in this wiping made the work too expensive.

I have some aluminum name-plates with a dead black background in which the letters are all clean cut and sharp with a perfect black background. This is just what I want. Can you tell me what kind of lacquer or pigment paint is used and also the method of procedure? I feel that this information will suit my work perfectly.

A.—Aluminum name plates are an entirely different proposition to yours. The black finish is produced by a special black nickel solution before the etching ground is removed from the letters. This is the reason why the letters are so sharp and clean cut.

To solve your problem we suggest the following procedure:

1. Finish and silver plate the electrical fixtures then finish the silver as may be desirable. Afterwards lacquer the silver surface and dry thoroughly, preferably at 100 to 120° F.
2. Now apply a coat of Dead Black "Jap a Lac" or an ivory black ground in Japan to the backgrounds. Then dry the surface a little until the black becomes tacky.
3. Then wipe off the black from the high lights with cloths moistened with a mixture of equal parts of turpentine and linseed oil. This mixture will not attack the lacquer. The black coatings will dry hard, so do not require to be lacquered for protection
4. If it is possible to use a stencil made of heavy paper and waxed with molten paraffine wax to cover the high relief parts of the fixtures, then the black finish could be applied through the opening in the stencils to the backgrounds and would therefore eliminate removal from the high lights.

Consumption of Tin Increases in United States

A Report from the Bureau of Mines, Washington, D. C.

By J. W. FURNESS

A notable increase in the consumption of tin in the United States within recent years is indicated as the result of a special inquiry conducted by J. W. Furness, mining engineer, Bureau of Mines, Department of Commerce. Returns received from more than 1,100 large consumers of tin show that in 1925 the imports of virgin tin were 76,640 tons as compared with imports of 69,518 tons in 1917. Reclaimed tin of record in 1925 amounted to 27,632 tons which compares with a total of 17,320 tons in 1917. A total of 104,272 tons of metal was available for trade consumption in 1925 as contrasted with total supplies of 86,838 tons in 1917. The 1917 figures quoted are taken from a compilation made by the the War Industries Board in that year. A careful canvass of the trade showed a total consumption of 117,406 tons of tin in 1925, indicating a consumption of 13,134 tons more than the indicated available supply.

Since 1917 there has evidently been a great increase in the consumption of tin in tin and terne plate, in babbitt, brasses and bronzes, and in solder. Apparently at the end of the war all visible supply of tin was consumed, or in the hands of consumers. Consumers' stocks are an undetermined factor in the supply and may account for more than 13,134 tons excess of consumption over visible supply in 1925. Unquestionably, however, a part of this unaccounted for metal may be attributed to the short service rendered by the finished article and the rapidity with which it finds itself again in the melting pot; thus the metal may be re-used several times during a year. An inference that might be drawn from the study is that the accumulated free stocks of tin are never high.

Babbitt and bearing metals, brasses and bronzes, castings, white metal and type metal are the only uses for tin serving for a short period of time that allow the metal to be re-used, but even these uses cause very considerable losses. The metal used in tin and terne plate, solder, foil, collapsible tubes, chemicals, etc., is practically dissipated for all time.

In 1925, the production of terne plate in the United States was 100,000 tons and that of tin plate 1,550,000 tons. The 1917 canvass showed a production of 75,000 tons of terne plate and 1,425,000 tons of tin plate. The tin used for tin and terne plate in 1925 amounted to 34,481 tons, as compared to 27,600 tons in 1917.

Tin plate is used chiefly in the manufacture of tin food containers. Some of the minor uses are addressing machine plates, alkali drums, bottles and jar caps, boxes and other containers, buttons and seals, carpet sweepers, cream separators, galvanized ware, gasoline stoves, gas stoves and furnaces, kitchen cabinets, lanterns, lye cans, metal ceilings, metal wheels, nickel-plating purposes, picture frames, powder kegs, stove boards, sinks, signs, novelties, paint drums, and refrigerating plants.

Terne plate is generally known as roofing tin and finds its principal use for this purpose. The amount of tin utilized in terne plate depends largely upon the coating of lead-tin alloy applied. In commercial practice, several grades of terne plate are on the market, varying from 8 pounds to 40 pounds per base box. As a rule the lead alloy used contains 25 per cent tin.

In 1925 there was a decided increase in the manufacture of terne plate over that of 1917, this increase being largely due to the requirements of automobile manufacturers. Upwards of 25,000 tons were used for this purpose in 1925.

In 1925, 28,406 tons of tin were used for solder as compared with 17,000 tons so used in 1917. The increased consumption of tin in solder, namely 11,400 tons, may be attributed in the main to the following industries: canning; automobile, consuming approximately 5,000 tons of solder per annum; the manufacture of individual refrigerators, consuming in 1925 upwards of 2,500 tons of virgin tin as solder.

In 1925, consumption of tin in babbitt and bearing metals was 11,565 tons greater than that of 1917. The major part of this increase is unquestionably due to the automobile industry.

The 1925 consumption of tin in brasses and bronzes was 11,949 tons in excess of that of 1917. Again the automobile industry is responsible in part for this increase; also the manufacture of refrigerators.

In 1925, there was apparently a decrease of 1,007 tons from 1917 in the use of tin in foil. This decrease may be attributed largely to the substitution of aluminum. The slight increase in the use of tin in collapsible tubes, 373 tons, is ascribable to no special cause. The manufacture of collapsible tubes has increased very materially during the years under discussion and there has been a very material substitution of aluminum for tin in this use.

In 1917, chemical uses consumed 1,718 tons of virgin tin; in 1925, they account for 2,152 tons. The slight increase is probably due to normal increased consumption.

The principal centers of the consumption of pig tin are:

Tin and terne plate, Pittsburgh, Pa.
Solder, Chicago, Ill.
Babbitt, bronze and brass, Detroit, Mich.
Foil, New Jersey, Michigan, Missouri and New York.
Collapsible tubes, Northern New Jersey.
Type metal, Chicago and New York.

Statistics and further detail are contained in Information Circular 6019, by J. W. Furness, copies of which may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.

Heat Treatment and Hardness of 60:40 Brass

The object of the experimental work was to study the effects of mechanical work on rolled 60:40 brass, quenched and reheated, and the mechanism of twinning in the alpha reeds of a furnace-cooled specimen.

The rolled stock was furnace-cooled to give a mixture of alpha reeds embedded in a beta matrix and then compressed and reheated. After compression, the alpha reeds were filled with slip bands; the beta structure had not changed. Reheating this strained material, caused the alpha reeds to re-crystallize and form twins at as low a temperature as 300° C. Further work would undoubtedly have lowered this re-crystallization temperature. The beta did not change its appearance. It is believed, therefore, that in a mixture of the two phases, alpha and beta, the solid solutions act independently. The alpha acts according to the general statement that the greater the amount of cold work the lower the temperature of recrystallization. The beta remained unchanged during the entire process.—FRANCES HURD CLARK, New York.*

* Abstract of a paper read at the February, 1927, meeting of the Institute of Metals Division in New York.

The Metal Industry

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER THE ELECTRO-PLATERS' REVIEW

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Contents

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EDITORIAL

TIN IN THE UNITED STATES

The United States is the largest consumer of tin in the world. It produces practically none. In actual figures, in 1925, 76,646 tons were imported and 27,633 tons were recovered from scrap, making a total of 104,279 tons for consumption. In that year, the United States produced 12 tons of tin.

Being the largest consumer of metallic tin (absorbing 52 per cent of the world's output), the United States is, of course, the largest manufacturer of tin products. The most important outlet for tin is tin plate, which is used for roofing, tin cans or containers, cooking utensils and other kitchen ware. American production of tin plate in 1925 was about 1,550,000 tons and 60 per cent of this output went into tin cans or containers, making up over 8,300,000,000 cans.

The other uses for tin are in soft solders made up of tin and lead; bearing metals, containing tin, antimony and lead, and sometimes copper; bronze; tin foil; pewters and Britannia metal.

The following published by the Bureau of Mines, show where tin went in 1925 and in what quantities.

	Tons
Tin and terne plate	34,481
Solder	28,406
Babbitt	22,365
Brass and bronze	16,749
Foil	2,993
Collapsible tubes	2,473
Chemicals	2,152
Tinning sheets, plates and tubes	1,946
Castings	1,063
White metal	1,041
Type metal	909
Tinning wire, nails, etc.	695
Miscellaneous*	2,133
	117,406

*Included in the miscellaneous uses are the following: soda fountain supplies, Britannia metal, bell metal, silk, composition and fire sprinklers.

The sources of this material are the Malay States, Dutch East Indies, Bolivia, Nigeria and China. The first three are by far the most important and are controlled largely by Great Britain. The only large sources out of their hands are the Dutch East Indies, China and Siam, and now a large part of the Dutch East Indies tin is smelted by a British company. Bolivian tin is almost entirely handled in Great Britain and Germany.

In almost no other field of interest to American industry is the situation so anomalous. In common with all other materials the price of tin varies with its availability and when it becomes scarce, the cost naturally rises. While there are other raw materials which we use and are unable to produce, nevertheless we do have a certain amount of control over them by partial or complete ownership of the producing organizations. Tin, however, seems to be in a class by itself. We are absolutely dependent upon it. We have built up an enormous industry around it, and we have to take it as we get it and pay the price set by others.

The way out of this dilemma seems at this time to be non-existent. We have no tin deposits in the United States. The foreign sources are closely held and not obtainable. The only other hope is the development of substitutes which will relieve the major industries and place others in a position where they are not hopelessly dependent upon one material.

We have long known that tin is not the perfect coating for steel, particularly for food containers. It is better than anything we have but its imperfections do cause trouble. Imperfections and small holes in the coating and chemical action of certain materials have been known to cause spoilage of food and trouble to the consumer. What can replace it? Possibly lacquers, possibly enamels of new type, possibly an electro-deposited plate of some other material, such as, for example, chromium. At the present writing, none of these methods are ready commercially to replace tin, but the fact that this subject is more and more in the minds of the manufacturing interests, seems to indicate that it will be only a matter of time before something is developed which will be satisfactory. The increased effort and energy spent on this problem will eventually bring results.

It would take a long time even after the discovery of a good substitute, to educate the public to the use of a material other than tin, but we know now how work of this kind can be done. Educational campaigns through the right media may be expensive, but properly handled they are successful. The public can be taught.

Long distance predictions are rarely safe, but we are willing to venture one to the effect that some day, somehow, tin will not be the only material suitable for food containers that it is today. That it will be replaceable in all other lines is neither possible nor perhaps desirable, but the absolute dependence upon one material over which we have no control, will not continue forever.

SIMPLIFIED PRACTICE PROGRESS

Communications from the Department of Commerce keep us informed of the progress of the Division of Simplified Practice whose business it is to aid industries, voluntarily and co-operatively to cut down and eliminate sizes, lines and styles of products. During last May a National Committee on Metals Utilization was completed and this committee undertook among other things the standardization of the following products:

Valves
Brass and bronze name plates
Brass, copper and zinc for bearings
Brass seated unions
Copper and brass pipe and tubing
Oil burners
Pressure regulating valves.

In connection with the work of standardizing these lines the following facts have been ascertained.

1. In a list of 55 completed simplifications the average elimination is about 80 per cent. In other words 80 per cent of the business done is in 20 per cent of the varieties offered. We wonder if this is true of non-ferrous metal trades. Our guess is that it is.

2. A recent audit of 11 recommendations shows that about 82 per cent of the firms covered by these recommendations observed them. In other words these indus-

tries are finding that simplification pays them to adopt.

3. Savings estimated by leaders in different fields range from $1,000,000 per year in paving bricks to $200,-000,000 per year in lumber. What would be the effect of such a program on all the metal industries?

Manufacturers of commodities of all kinds will do well to communicate with the Department of Commerce, Division of Simplified Practice to find out if recommendations have been published in lines which they manufacture or purchase. Following these recommendations is very likely to result in immediate savings.

We have a more recent communication to the effect that simplified practice recommendations adopted during the past quarter included carbon brushes and brush shunts for electrical apparatus. This should be of primary interest to plating generator manufacturers who should lose no time in familiarizing themselves with these recommendations.

Consideration is under way by groups dealing with foundry practice, foundry refractories and plumbing fixtures which undoubtedly includes the work of the American Foundrymen's Association.

To list the work in full would be impossible. We simply mention a few of the outstanding items which will appeal to our readers, and urge strongly that they inform themselves, through the Department, of progress in their lines and take steps wherever possible to apply these recommendations.

FOUNDRYMEN'S ASSOCIATION WORK

At this time, between meetings of the American Foundrymen's Association, it is not amiss to say a word for the work which this body is doing to further the interests of the foundry industry. In its last Bulletin are listed some of the activities which are making this Association more and more worth while to the industry and more indispensable to its members.

A new Committee has been appointed to consider the advisability of having purchasers place the weights of their castings on their blueprints. The returns from a questionnaire showed the members in favor of such a step, but some of the objections were important and the committee hesitated to urge the adoption of this measure. Compromises are being discussed and steps should be taken in the near future to reach some definite conclusion. As everyone knows it is difficult to estimate weights from blueprints, and it is only fair that at least a part of the responsibility for the weight of the casting should rest on the buyer as well as on the seller.

The Committee on Molding Sand Research has completed a survey of molding sand resources of various states; made a study of properties of clays; a study of refractoriness of molding sands; improved the design of permeability testing equipment; developed tentative standard methods for testing core sands; developed approved shop control methods of testing sands and developed tentative standards for expressing grain fineness and clay content in grading foundry sands.

S. W. Utley, the new president of the Association is the representative on the Department of Commerce Committee to investigate the elimination of waste in the metal industries. Mr. Utley recommends that the Association co-operation can best be maintained by having a special committee on waste elimination with representatives from malleable, steel, iron and metal foundries. The work would consist in a general way of cutting down the number of sizes, styles, etc., of the items such as bushings, etc., made for the trade. Numerous other openings exist for this committee's work.

The Joint Committee on Pattern Equipment Standardization has presented for approval a set of recommended practices and tentative standards.

The Cost Committee has proposed definitions for basic cost departments; establishing standard basic departments; determining what are direct and indirect costs, and determining a practical manner of distributing indirect costs.

We could go on at much greater length to describe the activities of the American Foundrymen's Association in addition to its regular work of presenting papers and holding exhibits of foundry equipment, but this is unnecessary. In spite of the fact that some recent years have been difficult to foundries, and that technical associations are naturally among the early and severe sufferers when business conditions are troublesome, the Association has grown to 2,176 members, rising from about 1,450 members in 1922. This record speaks for itself.

AMERICAN WAGES

It seems that there is disagreement, particularly in England, about wages in the United States. Only a short time ago American wages were supposed to be the highest, both in dollars and in buying power. A book by two English visitors expounded the glories of our methods which resulted in such widespread prosperity. Now, however, it seems that this is all a myth. According to newspaper reports, an Industrial Commission sent last fall by the British Government, reports that America has few lessons of importance to teach the employers and trade leaders of Great Britain. "Wages are admittedly high in the United States, but so is the cost of living; and industrial co-operation although it is good in America, is not greatly ahead of the systems employed in England."

The Commission, of which Sir William Mackenzie was the head, was made up of older and more experienced heads than those who had broken into print on the other side of this question.

We cannot help feeling like an "interesting specimen," being examined minutely and with great solemnity by students. We must admit that we, ourselves, do not feel sure of the secret of our high wages or low wages or success or failure or anything else which our friends wish to attribute to us. We have no choice but to go on doing the best we can. Our object is quite clearly not to do better than others but to do as well as we can for ourselves. Although is may be worth while for other nations to send investigating commissions and we are of course glad to co-operate with them, we must nevertheless feel less concerned about their conclusions than about conditions as we ourselves feel them.

GOVERNMENT PUBLICATION

Tinware, Galvanized and Japanned Ware. Simplified Practice Recommendation No. 55. U. S. Department of Commerce, Washington, D. C.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

LEAD ALLOYS IN BRASS FOUNDRIES

The following correspondence refers to a letter from Thomas Harper of New York, protesting against compensation insurance rates for brass foundries. This letter was published in our issue for November, 1926, page 468.—ED.

To the Editor of THE METAL IDUSTRY:

Regarding the action of the Metropolitan Brass Founders' Association in the matter of classifying brass foundries with respect to the quantities of lead used in their alloys and the effect of this circumstance on insurance rates, I enclose a copy of a letter addressed to Mr. James A. Beha, Commissioner of Insurance, asking for consideration and relief from the burden imposed by bringing our trade all under one classification.

M. E. PAULSON, M.E.,
Secretary, Metropolitan Brass Founders' Association.

Brooklyn, N. Y., March 3, 1927

MR. JAMES A. BEHA,
Commissioner of Insurance,
Albany, N. Y.

Dear Sir:—At a regular meeting of this association, held February 16, 1927, the matter of manual rates affecting employees in non-ferrous foundries was under discussion. This circumstance was brought about some time prior to the above noted meeting owing to the fact that the rates have been considerably increased and are, in the opinion of members of this industry, becoming higher than the risk involved should warrant.

The writer was directed by the members present at the February 16th meeting to call your attention to the fact that non-ferrous foundries should be separated into, at least, two classifications, to wit: those prducing alloys containing high percentages of lead—and those producing the ordinary run of brass and bronze compositions.

Highly leaded alloys subject the workers to the possibility of poisoning by this metal, and this fact has recently been brought forcibly to our attention through the reported death of four workers in a foundry operating in Rensselaer County.

We would further like to call your attention to the fact that a very small percentage of the non-ferrous foundries operating in this State come under this classification of shops producing high lead alloys; and that, therefore, a hardship is being worked on this group of foundries, which they should not be called upon to carry.

Will you kindly give this matter your attention as soon as convenient and if you feel that the association can supply any additional data, we will endeavor to do so at your request.

METROPOLITAN BRASS FOUNDERS' ASSOCIATION,
W. E. Paulson, M.E., Secretary.

New York, N. Y., March 1, 1927.

LEAD POISONING

To the Editor of THE METAL INDUSTRY:

With regard to lead poisoning, our Plant Physician advises as follows:

"At the present time the occupational diseases, which include lead poisoning, are not compensable in Pennsylvania.

"There is a movement on foot, however, to try to change the law at the next meeting of the Legislature to compensate all of the occupational diseases."

He comments on our own experience as follows:

"Since July 5, 1921, there has been only one case of lead poisoning which has prevented the man from working for a period longer than two days. All told six men have been incapacitated for work by lead poisoning during the last five years."

A large part of our tonnage is in high lead alloys (bearing metals) and I feel, therefore, that the record above noted has been possible only by reason of good working conditions, and care and attention given to the first symptoms of poisoning.

G. H. CLAMER,
President and General Manager Ajax Metal Company.

Philadelphia, Pa., March 8, 1927.

CLEANING CORE BOXES

To the Editor of THE METAL INDUSTRY:

We note on page 62 of the February, 1927, copy of METAL INDUSTRY a question and answer in regard to the cleaning of aluminum core boxes. We can agree that cleaning core boxes with gasoline or coal oil is certainly unsatisfactory, but the sand blasting of aluminum core boxes will in time affect the trueness of the box and therefore the cores.

A chemical method of emulsifying the oil and loosening the core sand so that it will wash away has been adopted in a number of cases by firms who would under no conditions agree to the use of a sand blast, because of the possibility of affecting the lines and edges of the core box. The procedure used is to merely place the core boxes in a tank of hot solution for a length of time which depends upon the amount of oil and sand which has accumulated. The solution is, of course, absolutely harmless as far as any detrimental effect on the aluminum is concerned, and in some cases tends to bring the metal out somewhat brighter than it originally was. We give this information because it has been our experience that many users of aluminum core boxes will not consent to the use of sand blast and would prefer to use a chemical method which they could be certain was absolutely harmless to the aluminum.

OAKITE PRODUCTS, INC.,
C. Johnson, Technical Department.

New York, February 17, 1927.

To the Editor of THE METAL INDUSTRY:

I have the letter of C. Johnson in reference to cleaning core boxes.

I am glad to know there is a chemical method of emulsifying the oil and loosing the core sand that sticks to core boxes, will not affect the aluminum and tends to brighten the metal. I would be pleased to learn of the name of such a chemical or the method.

I will say, as far as the sand blast is concerned, if proper precaution is taken in sand blasting, no more harm is done the core box than scraping the sand from the parting lines. It may be, however, that this chemical method is preferable.

It would be interesting to the trade to learn this method and trust Mr. Johnson can see his way clear to give us this information.

W. J. REARDON.

Detroit, Mich., February 22, 1927.

ZINCING VS. GALVANIZING

To the Editor of THE METAL INDUSTRY:

It seems to me that the suggestion which has been made, I believe by Mr. Tuthill, to use the word "zincing" instead of "galvanizing" as a broad term to cover the process of coating with zinc by the hot-dip process is entirely satisfactory.

For the products coated by the hot-dip process, I would suggest the named "zinced." This term is descriptive and finds a precedent in the name used when talking of "tinned" articles.

For coatings deposited by electrolytic means, it seems that the words, "zinc plated," could be used. This parallels "nickel plated," "chromium plated," and "brass plated," terms which are now in common usage.

The oldest process of the sherardizing type is the surface carbonizing of iron, generally called "case hardening," and the corresponding aluminum process is known as "calorizing," a coined word. The amount of material coated by sherardizing is relatively small and the product has a somewhat restricted use. I suggest that no attempt be made to rename this product until a descriptive and euphonious term is brought forward.

For the spray process, I think "zinc-sprayed" is a proper description and a combination that can be readily adopted by the trade.

J. A. SINGMASTER,
General Manager Technical Department,
New Jersey Zinc Company.

New York, N. Y., March 15, 1927.

New Books

Six-Place Tables. By Edward S. Allen. Published by McGraw-Hill Book Company. Size 4 x 7, 128 pages. $1.25.

This is a handy book of tables prepared to suit the needs of those who do calculating work and want a set of tables which can be kept in the pocket. The work is necessarily condensed, very convenient in size and arrangement.

It includes the following data: Squares, Cubes, Square Roots, Cube Roots, Circumferences and Areas; Fifth Roots and Fifth Powers; Circumferences and Areas of Circles; Logarithms of Numbers; Logarithmic Sines, Cosines, Tangents and Cotangents; Natural Sines and Cosines; Natural Tangents and Cotangents; Natural Logarithms of Numbers; Exponential and Hyperbolic functions; Trigonometric Formulas; Integrals.

Introduction to Metal Work. By T. R. Parsons. Published by Spon & Chamberlain. Size 5 x 7, 121 pages. $1.50.

This work is intended espceially for those taking up metal work either as a vocation or as a side line. It is written in comparatively non-technical language and covers a very wide field. In addition to the practical angles of metal work, it gives the student an idea of the sources of the metals which he uses and thus supplies him with something of a background for his trade.

An idea of the scope of the book can be gained by the subjects covered which are: Definition of Terms (hardness, malleability); Materials (iron, copper, lead, zinc, aluminum, etc.,); Heat Treatment of Metals; Workshop tools; Tinplate work; Soldering and Brazing; Forge work; Lathes and Lathe work; Processes and Notes (cleaning, polishing, burnishing, lacquering, etc.).

Patents. By R. S. Hoar. Published by Ronald Press Company. Size 5½ x 8½, 232 pages. $4.50.

Patents is a book written essentially for the business executive who needs a working, practical, comparatively simple explanation of this complex field. It is written by a patent attorney with extensive legal practice, but from the business viewpoint, namely that of obtaining a sound patent, proof against infringement and with a minimum of loss through lawsuits, etc.

The business executive or egineer whose work calls for much contact with the Patent Office will use it as a reference book and a guide in "patent tactics."

Some of the subjects covered are: What is a Patent; What is Patentable; Infringement; Patent Office Procedure; Interference; Protecting an Invention; Choice of an Attorney; Searches; Organizing a Patent Department; Foreign Patents.

Statistical Abstract of the United States for 1925. Published by the U. S. Department of Commerce, Washington, D. C. Sold by Superintendent of Documents, Washington, D. C. Size 6 x 9, 846 pages. $1.00.

This is the 48th annual volume issued by the Department of American Vital Statistics, concerning the life and business of the American people. It covers mining and manufacturing, foreign commerce, agriculture, forests, fisheries, census figures, finance and public debts of National, State and Local Governments, Federal reserve statistics, commercial failures and general business finances. It also includes information on transportation, electric light and power, telephones and telegraphs, public rates, wholesale and retail prices, wages, national wealth, immigration, etc. This is without doubt a most important, and, of course, authoritative publication along business lines. There is no other volume like it and every progressive business organization should have a copy in its library.

Proceedings of the 29th Annual Meeting of the American Society for Testing Materials—1926; in two volumes. Part 1, 1,204 pages. Part 2, 2,691 pages. Size 6 x 9. Published by the American Society for Testing Materials. $6-$8 per volume depending upon the binding.

This annual compilation of proceedings includes items of special interest to the metal field.

Part 1—

Report of Committee B-1 on Copper Wire.

Report of Committee B-2 on Non-Ferrous Metals and Alloys.

Appendix 1. A Proposed Outline for Specifications for Rolled Zinc.

Appendix 2. The Properties of High-Strength Aluminum Casting Alloys.

Appendix 3. Fluidity Tests of White-Metal Bearing Alloys—E. R. Darby.

Report of Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys.

Report of Committee B-4 on Metallic Materials for Electrical Heating.

B 9-26 T. Bronze Trolley Wire.

B 48-26 T. Soft Rectangular Copper Wire.

B 58-26 T. Aluminum-Base Sand-Casting Alloys in Ingot Form.

B 26-26 T. Aluminum Base Alloy Sand Castings.

B 59-26 T. Aluminum Bronze Castings.

B 60-26 T. Sand Castings of the Alloy; Copper 88 per cent; Tin 8 per cent; Zinc 4 per cent.

B 61-26 T. Steam or Valve Bronze Sand Castings.

B 62-26 T. Composition Brass or Ounce Metal Sand Castings.

B 24-26 T. Aluminum Ingots for Remelting.

B 25-26 T. Aluminum sheet.

Part 2 includes: The technical papers read at the meeting, among which are the Fatigue of Metals by Direct Stress, by P. L. Irwin; Stress-Strain-Cycle Relationship and Corrosion-Fatigue of Metals, by D. J. McAdam, Jr.; Effect of Grooves, Threads and Corrosion Upon the Fatigue of Metals, By R. R. Moore; Recent Developments in the Use and Fabrication of Corrosion-Resistant Alloys, by T. H. Nelson; The Microstructure of Zinc Coatings, by W. H. Finkeldey; The Etching Characteristics of Constituentss in Commercial Aluminum Alloys, by E. H. Dix, Jr., and W. D. Keith; Aluminum Casting Alloys: The British Engineering Standards Association Specifications Reviewed, by George Mortimer; Some Mechanical Properties of Duralumin Sheet as Affected by Heat Treatment, by R. J. Anderson, Effects of Size and Shape of Test Specimen on the Tensile Properties of Sheet Metals, by R. L. Templin.

Employment Statistics for the United States. By R. G. Hurlin and W. A. Berridge. Published by the Russell Sage Foundation. Size 6 x 9, 215 pages. Price payable in advance, $2.50. For sale by THE METAL INDUSTRY.

The Russell Sage Foundation has issued a plan for the national collection of employment statistics and a hand book of methods recommended by the Committee on Governmental Labor Statistics of the American Statistical Association. In view of the fact that metal manufacturers in many states are making monthly reports on employment and earnings to State or Federal bureaus, this book should be of considerable interest.

Accurate statistics are now known to be the guide posts of industry, and employment statistics are among the most important collected. They register changes in business activity by industries and by localities, reflecting the labor market, indicating the economic position of the wage-earning population and its purchasing power.

The plan advocated calls for monthly pay roll statistics obtained from selected employers in all important industries, elimination of duplication and prompt publication of this data.

Methods of obtaining the above information are described in non-technical language, showing how to collect pay roll statistics, tabulate them, build up an index of employment or earnings and publish these results in simple and intelligible fashion.

TECHNICAL PAPERS

Manganese in Non-Ferrous Alloys by M. G. Corson, New York, N. Y. This paper will be presented at the Cleveland meeting of the American Institute of Mining and Metallurgical Engineers. It contains information on properties and uses of manganese alloys, which has been incomplete and scattered. Hardness, strength and electric features of copper-manganese series are discussed and the physical changes in structure to which they are due; this includes properties of alloys beyond the minimum melting-point composition. Manganese bronzes, Heusler bronzes, manganese-silver and manganese-aluminum alloys are especially described.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ACID RESISTING METAL

Q.—We are desirous of learning if there is any formula of metal that will withstand the action of sulphuric acid (neat).

We also enquire what action, if any, a solution of alcohol and iodine would have on standard red brass mixture. What is considered the best formula for brass to give durable service with this solution?

A.—The best bronze alloy to stand sulphuric acid that we know of is composed of 90 copper and 10 aluminum. Such work as pickling baskets, pickling tanks, chemical stills, hooks, slings, wire ropes, chains, tanks, tie-rods, outlets, guides and fittings in semi-continuous pickling equipment are made from this alloy and give very excellent results.

We do not have any data on what action a solution of alcohol and iodine would have on red brass, but we are of the opinion if the casting is sound and a good clean casting free from dross and dirt, it would have no action whatever.—W. J. R. Problem 3,624.

BRIGHT NICKEL AND WHITE GOLD

Q.—Will you kindly let me know what is the best method to make a bright nickel solution and how to work it; also a white gold solution.

A.—For bright nickel plating, the following formula will give ideal results. Water, 1 gallon; single nickel salts, 12 oz.; nickel chloride, 1 oz.; ammonia chloride, 2 ozs.; boracic acid, 2 ozs.; cadmium chloride, 1/32 oz. Prepare the solution in the order given, using ⅓ of the water at 180° to 200° F., to dissolve the salts. The cadmium chloride should be added last. Two-thirds cold water should be placed in the tank, then the hot nickel solution prepared as outlined should be added. When operating bright nickel solutions, a slightly higher free acidity is required to keep the cadmium thoroughly incorporated in solution. For this purpose the addition of 1/16 to ⅛ oz. of muriatic acid should be made at the close of each day's work per gallon of solution after the first few days. The replenishing should be on the basis of hot water, as necessary to dissolve the salts; single nickel salts 16 ozs.; nickel chloride 4 ozs.; boracic acid 1 oz. In mechanical plating, cadmium metal sticks can be used in the place of the chloride to maintain the metal constant.

White gold soution: The deposition of white gold is somewhat of a problem due to the possibility of either metal depositing in excess, the results being either a white gold with a greenish shade or too white a color. Gold and cadmium makes the best alloy. We suggest the following formula:

Water 1 gallon; sodium cyanide 2 ozs.; sodium gold cyanide ½ oz.; cadmium trisalyt 1 oz.; caustic potash ¼ oz.; sal-ammoniac ½ oz. Temperature 80° F., at 3 to 4 volts; 14 or 18 K white gold anodes. Prepare the solution in the order given. Use ⅓ of the water first at 140 deg. F., then add the balance of the water as required. The color must be regulated with gold or cadmium as required.—C. H. P. Problem 3,625.

COLD METAL

Q.—Will you please tell us the cause of the trouble in the piece of bronze retainer sent under another cover.

A.—On examination of sample casting, we find your trouble is due to separation and this is caused by pouring your metal cold. As the metal seems to be of a good grade we suggest you pour your metal at approximately 2,100 degrees Fahrenheit. We are of the opinion that this will overcome your trouble.—W. J. Reardon. Problem 3,626.

CYANIDE COPPER

Q.—We have a little trouble with our cyanide copper solution; when we put on too much current it blisters and rub soff; when we put on less current it plates very weak, not covering very well. Our solution is composed of copper cyanide, cyanide and bicarbonate of soda.

A.—Presumably your cyanide copper solution is deficient in free cyanide and a reducing agent such as sodium bisulphite. These additions together with a small amount of caustic soda as a conducting agent will overcome your problem.

Make additions per gallon of solution as follows:

1. One oz. sodium bisulphite.
2. One half oz. caustic soda.
3. One oz. sodium cyanide 96-98%.

It may be necessary to add a total of 1½ ozs. sodium cyanide. You can determine this if the anodes stay dark when the current is turned off for 5 minutes. Dissolve Nos. 1 and 2 direct to the solution; dissolve the cyanide in as little hot water as possible, then thoroughly stir the solution.—C. H. P. Problem 3,627.

COPPER DIP

Q.—We have a large number of small parts of sheet steel and we are plating them in a cyanide copper solution.

As this is too expensive a process, we are trying to work out a cheaper method of handling them and would like to try plating them by immersion, a process similar to that of handling the Bessemer steel rods.

A.—The following coppering solution for immersion should give you excellent results. The articles to be coppered should be clean and bright and preferably dry when immersed in the dip.

Copper Dip Formula:

Water	1 gallon.
Sulphuric acid	8 ozs.
Dry copper carbonate	4 ozs.

Immerse the articles only long enough to obtain a bright uniform copper deposit. The upkeep of the solution is a little acid for brightness and copper carbonate when the copper deposits slowly. Dry out carefully and thoroughly after washing the copperized product in cold and boiling hot waters.—C. H. P, Problem 3,628.

ELECTRO-STRIP

Q.—I would like some information about a nickel strip for iron, brass, etc., to be used with reverse current from the dynamo. I now have one composed of 1½ gallons sulphuric acid and 2 quarts nitric acid, 10 gallons water, in a 15-gallon crock, using lead anodes, 6 volts, reverse current. The strip leaves the brass work pitted in about 5 minutes and has a green scum on it. It is not a clean bright brass.

On the iron work, it takes about 20 minutes to remove the nickel and it then comes burned; a dark gray color instead of a clean iron color. The anodes turn white instead of dark brown and the solution does not seem to draw quickly and smoothly. We have a large quantity of work to be stripped and do not care to use the plain acid dip as some work is iron and steel.

A.—The most satisfactory electro strip for all commercial metals is as follows:

Sulphuric acid 66°	1 gallon
Water	1 pint
Glycerine	1 oz.

The solution should be operated with a reverse current. The articles to be stripped become the anode. For cathode, use sheet lead or copper which should entirely surround the articles to be electro-stripped. It is best to use a cut-out switch so that the current can be shut off, otherwise the hydrogen gas may explode from a spark. It is harmless, but makes a loud noise. Use about 5 to 6 volts with a fair amperage; 5 to 10 per sq. ft. of surface area. It is advisable to watch the stripping operation so that the articles may be removed at once when stripping is completed. The strip will result in all metals having a smooth surface when the deposit is removed if care is used.

Keep strip covered up tightly when not in use. Sulphuric acid absorbs atmospheric moisture. The solution requires little attention; add a little sulphuric acid occasionally.—C. H. P. Problem 3,629.

LUMPY SILVER DEPOSIT

Q.—Please give me some information on what causes small lumps to form on articles while silver plating. The solution seems to be in good condition, plates all right, but appears as if it were sediment that settles on the work.

A.—We believe that the small bumps to which you refer in your silver deposit are in reality small pieces of metallic silver which have become detached from the silver anode and are carried through the solution and deposited upon the work where they become cemented by silver plating over it.

First try enclosing your silver anodes in bags made up from two thicknesses of cheesecloth. These bags would prevent the small particles of silver from entering the plating solution. If not, then try bags made up from unbleached muslin sheeting.

Your solution may contain too much free cyanide, resulting in too rapid reduction of the anode. A small amount of silver cyanide added direct to the solution with constant stirring might correct the condition; ½ oz. silver cyanide per gallon might be ample. —C. H. P. Problem 3,630.

PLATING DIE CASTINGS

Q.—I am having trouble plating die castings with a mixture of metal consisting of 92 per cent zinc, 3 per cent copper and 5 per cent aluminum. I am plating these castings in large quantities and the trouble that I am having with this metal is that it peels away from the pores. The nickel sticks on all over, otherwise o.k. Am using a solution consisting of 8 oz. double nickel salts; 2 oz. epsom salts; 2 oz. common salt; 2 oz. boric acid, and 1 oz. of chloride of nickel.

A.—We should think that your trouble is due to buffing dirt that gets into the pores of the metal during the buffing operation from heat generated and pressure applied. If your only trouble is peeling of the nickel around the porous spots or pin holes, then you might overcome the trouble by soaking the castings in gasoline or benzine, after buffing. Then dry out in sawdust. Electro cleanse the die castings in a solution consisting of:

Water	1 gallon
Caustic potash	1 oz.
Tri sodium phosphate	2 ozs.
Soda ash 58 per cent	1 oz.
Sodium cyanide 96-98 per cent	¼ oz.

After electro-cleansing for a few moments at 180 deg. F. and 5 to 6 volts, remove the castings; wash in cold water and nickel plate direct. Some platers use a strike solution first with high current to deposit a film of nickel, then plate in regular solution. The strike is optional.

The nickel solution you mention has usually given good results. The following formula, however, has replaced it to a great extent.

Water	1 gallon
Single nickel salts	12 ozs.
Nickel chloride	1 oz.
Sal-ammoniac	1½ ozs.
Boracic acid	2 ozs.
Epsom salts	12 ozs.

As a brightening agent, to produce a bright nickel deposit, use ½ oz. cadmium chloride per 100 gallons of nickel solution. The chloride of cadmium should be dissolved in 8 ozs. hot water, then add 4 ozs. muriatic acid; mix thoroughly in the nickel solution. In preparing the new nickel solution, dissolve all the salts except the Epsom in as little boiling water as necessary for solution. Add the balance of the water to make up the gallon or gallons of solution, cold. Stir in the Epsom salts thoroughly in the nickel solution.—C. H. P. Problem 3,631.

PLATING RACK STOP-OFF

Q.—I have a number of copper racks upon which to hang work in nickel solution. Can you tell me of any kind of coating I can use to prevent the nickel depositing? Any kind of japan or varnish? I know that rack manufacturers rubberize them in some way. Can you tell me how to do that?

A.—Coal tar resin should be a good material for coating plating racks. The material is not acted upon by alkalies or acids and resists temperatures up to 300 deg. F. It is reported that a glass-like cement can be produced upon metals that is insoluble in alkaline solutions. Coat over the metal such as your plating racks with a dense solution of sodium silicate. When dry apply a concentrated solution of magnesium sulphate. An insoluble coating of magnesium silicate will result. A good stop-off varnish might answer your purpose; apply only 2 to 3 coats. You could apply green rubber to the frames, then vulcanize them. Any automobile tire vulcanizer should be able to rubberize the frames for you.

Special non-conducting racks can be obtained. See the advertising pages of THE METAL INDUSTRY.—C. H. P. Problem 3,632.

SILVER PLATED WARE

Q.—How would you replate table ware such as knives and forks, also water pitchers, etc., such as used in hotels and which are made of some soft metal?

We want to silver plate some of this work that is worn off in spots. We have in mind to strip off all the old deposit in an acid strip that color buffs and nickel plate for 15 minutes then strip in silver strike and then in regular silver solution for 15 minutes.

What metals are most of these knives made of? They seem to be steel and coated with lead then silver plated. Would 15 minutes in a silver solution be long enough? Would you lacquer them?

A.—Steel is used in the manufacture of what we term silver plated knives and forks. Some manufacturers silver plate direct upon the polished and cleansed steel by the aid of at least 2 silver strikes before the final silver plate. Other firms nickel plate the steel knives and forks first then silver strike and plate in regular solution. Products sold in ten cent stores are first nickeled, then lightly plated and finally color-buffed to a finished lustre. Water pitchers and similar hollow ware are made either of German silver or Britannia metal. The procedure in cleansing and plating both products (steel and Britannia) is almost identical. A universal strip is an electro strip prepared as follows: Sulphuric acid 1 gallon; water 1 pint; glycerin 1 oz. The product to be stripped is made the anode; the cathode should entirely surround the stripping tank and can be sheet lead or copper. After stripping old plated products, they should be polished, then cleansed with hot potash solution, washed and scoured with Pampico brush wheels and pumice stone and water. Follow up by 1 or more silver strikes based upon water 1 gallon; sodium cyanide 7 ozs.; silver cyanide ⅓ oz.; caustic potash ¼ oz.; sal-ammoniac ½ oz. Anodes sheet steel; voltage 5 to 6; time 10 to 15 seconds. After silver striking, plate in a regular silver solution. A 15-minute nickel plate would be followed by silver strike but a 15-minute regular silver deposit would be too short for a good wearing silver plate. Regular triple plate knives have one pennyweight of silver deposited upon them. You should at least deposit half this amount. Hollow ware is frequently lacquered; flat ware such as knives, forks, spoons are never lacquered.—C. H. P. Problem 3,633.

TUMBLING ALUMINUM

Q.—Can you give me any advice on the subject of tumbling aluminum castings? They are small triangular castings used on corners of ice boxes and weigh about 1¼ oz. each. Polishing and buffing the castings by hand make it too expensive. Any hints on the methods of tumbling these castings to a nice finish will be highly appreciated.

A.—Aluminum castings are somewhat of a problem to produce upon their surface a bright polished lustre by tumbling. However you can try out the following methods:

1. Tumble in a sharp sand with water, tri sodium phosphate or borax about 2 ozs. per gallon of water as the lubricant.
2. After tumbling in the sand and water remove and re-tumble with steel balls and a solution prepared as follows:

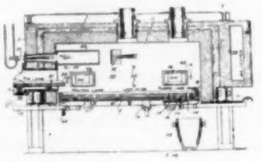
Water, 1 gallon; soap chips, 1 oz.; kerosene oil, 1 oz.

Use plenty of balls when tumbling aluminum. It may be necessary to use a heavy oil such as cylinder or flotation oil with pumice stone to give the desired cut down surface upon the castings, if the water and sharp sand do not give the desired results.—C. H. P. Problem 3,634.

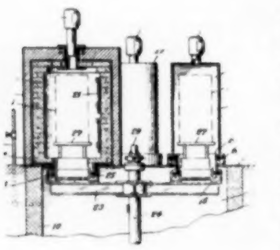
PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,616,233. February 1, 1927. **Process for Oxidizing Non-ferrous Metals.** Gabriel E. Rohmer, New York, N. Y., assignor to Andrews Lead Company, Inc., Long Island City, N. Y.



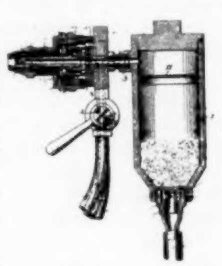
The method of oxidizing a non-ferrous metal which method consists in flowing the metal by gravity and in the form of a thin relatively wide spread flowing sheet through and out from the heated chamber of a furnace containing oxygen.



1,617,056. February 8, 1927. **Furnace.** Charles F. Kenworthy, Woodbury, Conn., assignor to Charles F. Kenworthy, Inc., Waterbury, Conn.

A furnace having a tank; a heating unit; and a cooling unit, all of which open into the chamber in the tank; and means within the tank for successively presenting work pieces into the heating unit and cooling unit; said tank being free of both liquid and oxygen.

1,617,166. February 8, 1927. **Device for Coating Articles with Glass, Enamel, Quartz and Metals.** Max Ulrich Schoop, Zurich, Switzerland.



In a device for coating articles, particularly with glass, enamel, quartz, metals and the like, a receptacle for the pulverulent coating material, adjustable means arranged at the bottom of said receptacle for admitting a stream of compressed combustible gas, nozzle means, means for supplying oxygen and two combustible gases to said nozzle means for producing a blow-pipe flame, means connected to the top of said receptacle for conveying the stream of gas and the material suspended therein to said nozzle means for projecting the material, the particles of which are heated to a high temperature by the combustion of the conveying agent, to the article to be coated, and baffle means provided above the body of material in said receptacle for attaining a uniform suspension.

1,617,285. February 8, 1927. **Granular Brazing Solder and Method of Producing the Same.** Charles H. Davis, Cheshire, Conn., assignor to The American Brass Company, Waterbury, Conn.

A brazing solder consisting of granules of a copper-zinc alloy coated with copper.

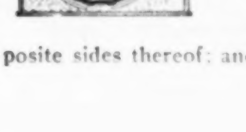
1,617,353. February 15, 1927. **Extraction of Gold from Dilute Solutions.** Walter O. Snelling, Allentown, Pa.

The process of extracting gold from dilute solutions which comprises passing a dilute solution of gold through a porous mass of amorphous precipitated tellurium.

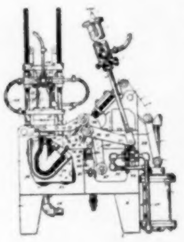
1,617,859. February 15, 1927. **Method of Annealing Copper Articles.** Sterner St. P. Meek, Philadelphia, Pa.

A method of annealing copper articles which consists in packing the article to be annealed in powdered metallic copper, sealing it in a container and then heating the entire container.

1,618,199. February 22, 1927. **Electrolytic Plating Machine.** Joseph Hulmer and Kaspar Jonas, Chicago, Ill.



An electrolytic plating machine including a solution holding tank; a shaft rotatably supported on the tank and carrying a perforated tumbling barrel for rotation through the solution contained therein; stationary U-shaped hangers bearing on the shaft with their arms depending on opposite sides thereof; and means arranged on said arms for carrying anodes in the solution within said tumbling barrel, substantially as described.



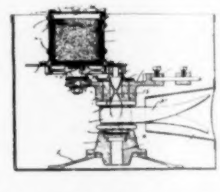
1,618,223. February 22, 1927. **Die-Casting Machine.** Ernest P. Pierce, Cleveland, Ohio.

In a die casting machine, the combination of a frame, a cylinder in said frame, a plunger mounted on said frame at an angle of substantially 45° to the vertical, means for operating said plunger in said cylinder, and a swingingly mounted die carrying frame adapted to be swung into and out of vertical position above the cylinder.

1,618,481-1,618,484. February 22, 1927. **Lacquer and Lacquer Enamel.** Stanley D. Shipley and Guy C. Given, Stamford, Conn., assignors to Atlas Powder Company, Wilmington, Del.

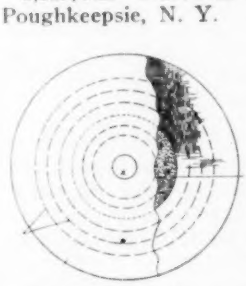
A coating composition comprising nitrocellulose and a variety of other organic substances constituting solvents and materials to go into solution.

1,618,779. February 22, 1927. **Centrifugal Coating Machine.** Henry W. Pleister, Westfield, N. J., assignor, by mesne assignments, to Diamond Expansion Bolt Company, New York, N. Y.



In apparatus for removing excess metal from metal coated articles, the combination with a table; of a support for said table eccentric thereof, means to impart a planetary motion to the table, a skeleton frame fixed concentrically on said table, and a reticulated article holder resistant to the heat of spelter removably held in said frame.

1,619,442. March 1, 1927. **Polishing Wheel.** John Steiner, Poughkeepsie, N. Y.



A polishing wheel composed of an inner porous portion and an outer portion secured together, said inner portion being comprised of felted fibers, said outer portion including a structure through which abrasive particles may pass comparatively readily, but adapted to hold and move them over a surface to be abraded, said porous portions being impregnated with an abrasive compound and adapted to feed the compound to the outer portions by centrifugal action as said wheel is revolved.

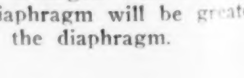
1,619,835. March 8, 1927. **Plating Metals.** Bertrand S. Summers, Port Huron, Mich., assignor to The Locomotive Terminal Improvement Company, Chicago, Ill.

As an article of manufacture, an article of iron covered with an electro-deposited coating of lead and nickel.

1,619,852. March 8, 1927. **Solder for Aluminum** and Its **Alloys.** Emile Conti, Alfortville, France.

A solder for aluminum and its alloys containing from about 52 to 66 per cent of tin; 46 to 23 per cent of zinc and 2 to 11 per cent cadmium, with the addition of a relatively small proportion (from 1 to 5 per cent) of chloride of sodium, sal ammoniac and alum.

1,620,052. March 8, 1927. **Electrolytic Apparatus** and **Electrode Therefor.** William G. Allan, Toronto, Ontario, Canada, assignor, by mesne assignments, to Farley G. Clark.



Electrolytic apparatus, comprising an anode and a cathode immersed in an aqueous electrolyte and spaced apart, a diaphragm pervious to the electrolyte and disposed between the electrodes, the said electrodes and diaphragm being so constructed and arranged that the area of the current path through the diaphragm will be greater than the greatest projected area of the diaphragm.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

Metal Polishing

By F. A. ZUCKER

Zucker Sons' Company, Inc., Elizabeth, N. J.

There have been many theories advanced as to just how a finish is produced on metal and the writer, being interested in such problems, has given considerable thought and time to the question, both experimentally and theoretically.

We must start at the beginning by admitting that in preparing a metal surface with abrasives before the finishing process is begun, there exist on the surface, abrasions or furrows, the size of which are determined by the grain size of the abrasive last used. At this stage of the operation metals show a dead lustre.

Fig. 1 shows a cross section which has been polished with say No. C F or 200 emery, considerably exaggerated in size to demonstrate the process.

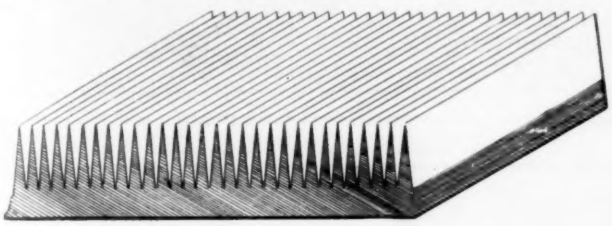


FIG. 1. ENLARGEMENT OF GROUND SURFACE

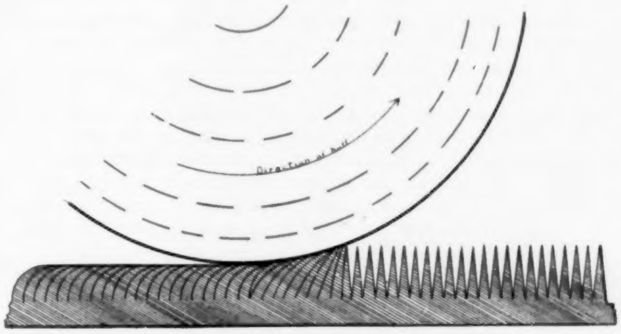


FIG. 2. EFFECT OF BUFF ON GROUND SURFACE

Note the saw tooth appearance. These are in reality large ridges of thin metal and each ridge is comparable to the sharp edge of a razor blade, standing erect.

Upon the first application of the buff running at high speed (see Fig. 2) these ridges or scales are rolled down. Under each one a small percentage of the polishing compound used is imprisoned and as a result of the heat generated there is a fusion of these turned down ridges and a combination with the metallic content of the polish and the carbon produced from the fat content of the compound. We have contiguous layers of metal like scales on a fish, with the under surfaces covered by layers of the polishing compound. To this condition the writer believes we owe the characteristic color reflection produced by the surface of the metal.

It is also the opinion as stated in a previous article on this subject for one of the cutlery magazines, that under this same theory as outlined above, carbon steel, when finished with a chromium composition, produces a partial if not complete stainless surface on this steel and maintains this property. This was demonstrated in our experimental department where several carbon steel burnishers were polished a year and a half ago, and without any other protective coating have retained their original high finish without spotting. Unpolished burnishers of the same stock are almost entirely covered with rust and black spots.

If it were possible to lay each tooth down in perfect alignment fused without a break in continuity on the entire polished surface of carbon steel polished with chromium compound or sterling silver polished with the right grade of red rouge, it is the writer's opinion that under these ideal conditions there would be no corroding or spotting occur on this steel, or tarnishing or oxidizing on a silver surface. Given the proper equipment with the necessary perfection in technique, this will be obtained in the not distant future.

And, finally, the writer believes that it is an established fact that it takes a metal to polish a metal and that the metal content in the polishing media must alloy with the metal to be polished. Upon these facts the above theory is based.

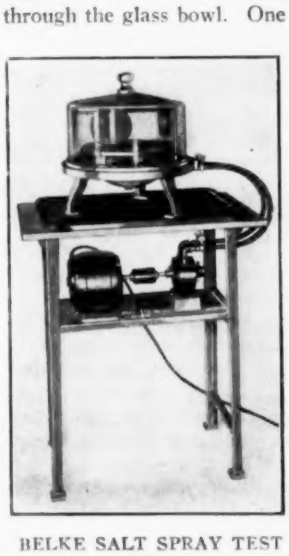
SALT SPRAY TEST UNIT

William E. Belke, president of the Belke Manufacturing Company, 2952 W. Van Buren Street, Chicago, Ill., has invented a piece of equipment to give the salt spray test. It is a piece of office equipment, arranged on a metal stand, with an attractive glass cover, intended for use by the plater, jobber and manufacturer. The apparatus will tell, in a short time, it is claimed, the exact period during which any plated thickness will last under the most severe weather conditions inland or on the coasts.

This salt spray test unit is intended to give an article the actual effect of being exposed to salt-laden atmosphere. The outfit consists of a pump, connecting with an area entirely enclosed with a glass top. The article is placed on a tip attached to a long arm under the glass top, and the top is put down. The motor is turned on, and the pump throws air into the chamber. The air atomizes the salt water at the bottom of the chamber, and sends it up as atmosphere. This atmosphere, intensified, passes over the article, and goes back into the pump, to pass through and continue in the air channel.

The object in bringing the air back is to relieve the pressure within the bowl, for if air were constantly pumped in, it would soon leak out through the apertures, and cause other articles within the room to rust.

When testing, the article is put through this process, and the gradual wearing away of the plate can be observed constantly through the glass bowl. One hour within the bowl, indicates about one day's exposure to the most intensive weather conditions, such as might be found during a storm, when the plate is beaten constantly. Thus, if the article can stand eight hours' test, it will stand eight days' exposure during a storm at the seaside; eight months' exposure under unusually severe conditions when storm is not encountered; eight to thirty years' inside exposure under normal coastal conditions, and life-time wear inland, or within enclosed rooms near the coast.



BELKE SALT SPRAY TEST UNIT

With each outfit, a supply of tags is included, which are to be attached to all shipments of plated goods, showing how many hours' test they have withstood. The entire outfit operates from the electric light socket.

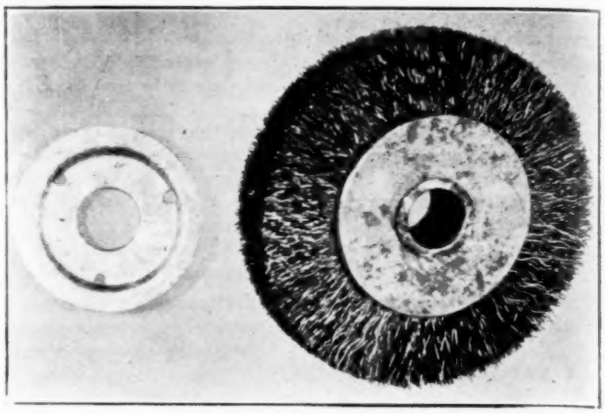
NEW CIRCULAR BRUSH

A new type of circular brush, for which important advantages are claimed, has just been placed on the market by The Specialty Manufacturing Company, Berea Road, Cleveland, Ohio.

The construction, as will be seen from the accompanying view, is simple. A pair of strong circular galvanized sheet metal stampings are used, provided with inwardly-turned projections or teeth. The tufts of bristle, fibre wire, or other material of which the brush is to be made are weighed on an accurate scale to assure each tuft in the brush being equal in balance and weight with the rest. Each tuft is then bent into V form and inserted between the successive teeth. A few turns of binding wire are then passed completely around the inside of the V, thus drawing the tufts tightly down into position between the pair of stampings in such a manner that it is impossible for the material of the brush to come loose or to fly out under the centrifugal force of the revolving spindle. Finally, the stampings are closed down on each other; and the teeth, passing through the openings in the opposite stamping, are clinched over under heavy pressure, compressing the brush material solidly together. It is then trimmed by a special process to make a perfect circle.

Among the advantages claimed are the following: In consequence of the accurate weighing and spacing of the tufts, the working surface of the brush is equally dense at all parts of the circumference. In this manner, perfect balance--heretofore a serious difficulty in circular brush manufacture—is obtained even at high speeds. This balance is still further assured by the absence of all welded joints and other unequal distributions of metal in the binding wires and other parts.

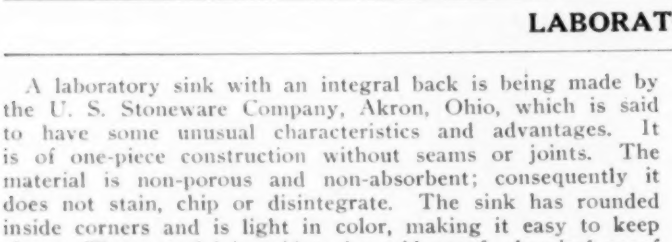
Another advantage is the satisfactory way in which single-thickness units may be made up in gangs to form wide-faced brushes. These gangs may be either assembled from separate units held in place by the pressure of the shaft end-washers, or else they may be clinched together by the teeth of the stampings themselves or secured by transverse rods passing through the entire gang of stampings by means of holes provided in a central reducer disc (not shown). The latter methods are, of course, preferable in cases where considerable pressure is brought to bear on the revolving brush-surface. When thus assembled in gangs, it is stated that the units will pack together much closer than the ordinary brushes in which the bristles are secured in place by twisting between wires, because the new construction permits a greater weight of brush material to be used. The increased density of the working surface thus obtained is not only conducive to longer wear, but it also permits a more even finish on the work—a matter of importance when a smooth polish is desired.


NEW CIRCULAR BRUSH

The illustration shows a single thickness unit. When it is desired to mount it on a polishing spindle, etc., of smaller diameter, a special reducer stamping, carrying a smaller hole, is fitted into the central opening.

NEW HARD RUBBER PUMP

The Ace hard rubber, Type G, rotary gear pump, motor, belt or hand driven, for the handling of corrosive chemicals, including acids, alkalis, and their solutions has been designed and is now being put on the market by the American Hard Rubber Company, 11 Mercer Street, New York. Some of the important applications for the use of this pump are removing and distributing of acids from carboys to tanks cars; pumping from tank to tank; pumping on acid tower work; filter press work; pressure up to 30 lbs. per square inch; direct agitation of plating or other solutions, etc.


HARD RUBBER ROTARY PUMP

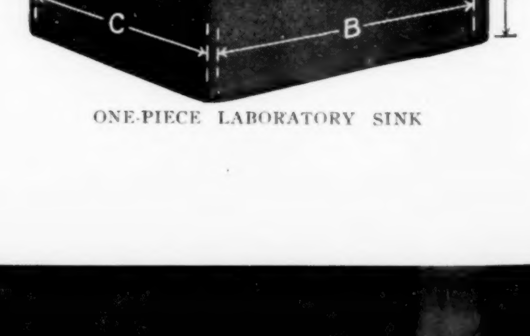
In this pump two hard rubber gears in mesh, work in conjunction with each other on the inside of a close-fitting casing. As these gears rotate they carry the liquid in the space between the gear and housing until it reaches the outlet. Here the gears mesh again, driving the liquid through the outlet pipe. The gear teeth are in continuous contact and are operating at a uniform velocity; therefore the discharge is continuous and not pulsating. The pump, taking its size into consideration is said to be very efficient in its capacity to deliver at comparatively high pressure heads. Every part of the pump mechanism which comes in contact with the solution handled is made of a compound of hard rubber, specially selected for its inertness to the action of active chemicals.

LABORATORY SINK

A laboratory sink with an integral back is being made by the U. S. Stoneware Company, Akron, Ohio, which is said to have some unusual characteristics and advantages. It is of one-piece construction without seams or joints. The material is non-porous and non-absorbent; consequently it does not stain, chip or disintegrate. The sink has rounded inside corners and is light in color, making it easy to keep clean. The material is said to be acid proof, chemical proof and corrosion proof throughout the entire stoneware body, with and without the glaze.

It is stated that the glaze on this sink will not crack or "craize" and that the cost is no greater than for natural stone, enameled or china sinks.

The U. S. Stoneware Company also has an office in New York, at 46 Church Street.



ONE-PIECE LABORATORY SINK

PRINCIPAL USES OF NICKEL

In the Twenty-fifth Annual Report of the International Nickel Company, for 1926, a list was given of the principal uses of nickel. Those uses relating to metal are as follows:

Nickel Silver (10% to 30% nickel): Standard white metal for silver-plated ware, flat keys and hardware, plumbing.

Aluminum and Zinc Base Die Castings (½% to 5% nickel): Automobile die cast parts, steering wheel spiders, hardware.

Nickel Bronzes (½% to 2% nickel): Bearings, valve castings, steam packing metal, pressure castings.

White Gold (15% nickel): Jewelry, eye glass and fine instrument mountings.

Heat Resisting Alloys (35% to 70% nickel): Heat treating boxes. (60% to 85% nickel): Electric furnace heating elements, carburizing boxes for steel treatment, structural furnace castings, tubes and retorts in chemical industry.

Electrical Alloys (25% to 80% nickel): Rheostat and pyrometer wire.

Copper-Nickel Alloys (15% to 50% nickel): Bullet jackets, corrosion-resistant castings, valves and valve trim.

Nickel for Coinage (25% nickel): U. S. 5c piece; (100% nickel): Foreign coins.

Nickel Anodes and Nickel Salts used in nickel plating.

Nickel as a catalyzer used in hydrogenation of edible oils.

Nickel elements in storage batteries.

Rolled Nickel (Pure malleable 99% nickel): Dairy equipment, hotel kitchen equipment, cooking utensils, canned food manufacturers' equipment, spark plug wire, etc.

WIRE DIPPING BASKETS

Included in the line of wire products manufactured by the Buffalo Wire Works Company, Inc., Buffalo, N. Y., are "Buffalo" wire dipping baskets. These baskets are made of plain steel, brass, copper wire, and, in many cases, steel wire zinc-coated after weaving. They serve a large variety of uses, principally in foundries for pickling castings and in plating works.

WIRE DIPPING BASKET

These baskets are said to be very durable and to enjoy wide usage throughout the industry. They are made up in various styles according to buyers' specifications.

EQUIPMENT AND SUPPLY CATALOGS

Gas. American Blower Company, Detroit, Mich.

Fine Styrian Steels. Erie Steel Corporatión, New York.

Portable Conveyors. Portable Machinery Company, Clifton, N. J.

Flexible Arch Tile. Geo. P. Reintjes Company, Kansas City, Mo.

The Monel Metal Primer. Eagle Brass Foundry Company, Seattle, Wash.

Blast Equipment. American Foundry Equipment Company, Mishawaka, Ind.

100 Years of Steel Improvement. The International Nickel Company, New York.

Bridgeport-Keating Flush Valves. Bridgeport Brass Company, Bridgeport, Conn.

Comparator Sets—to analyze nickel solutions. Meaker Company, Chicago, Ill.

Wild-Barfield Small Electric Furnaces. Automatic and Electric Furnaces, Ltd., London, England.

Anderson Service. Robert J. Anderson, Inc., chemists, metallurgists and consulting engineers, Cincinnati, Ohio.

Functions of the Advertising Manager. Policyholders' Service Bureau, Metropolitan Life Insurance Company, New York.

Burnishing Materials. A small box of a variety of sample metallic burnishing materials for use by the plater and manufacturer. H. Leroy Beaver, Philadelphia, Pa.

General Electric Publications: Automatic Arc Welding; Gears for Centrifugal Compressors; Automatic Switching Equipment; Control Panels for Industrial Electric Heating; Medium Speed Synchronous Motors.

1001 Alloy Formulas, Their manufacturing properties and industrial applications. By Ernest G. Jarvis, Niagara Falls Smelting and Refining Corporation, Buffalo, N. Y. An interesting and unusually comprehensive booklet for the foundryman, giving a large number of standard mixtures and also special metals made by this company.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

HEADQUARTERS, 140 S. DEARBORN STREET, CHICAGO, ILL.

The Nominating Committee of the American Foundrymen's Association for the year 1927 has unanimously nominated the following as officers and directors of the association:

For President to serve for one year:

S. W. **Utley,** Vice-President and General Manager, Detroit Steel Casting Company, Detroit, Mich.

For Vice President to serve for one year:

S. T. **Johnston,** Vice-President, S. Obermayer Company, Chicago, Ill.

For Directors to serve three year terms each:

E. H. **Ballard,** General Foundry and Pattern Shop Superintendent, General Electric Company, West Lynn, Mass.

H. Y. **Carson,** Research Engineer, American Cast Iron Pipe Company, Birmingham, Ala.

W. D. **Goldsmith,** Treasurer, C. A. Goldsmith Company, Newark, N. J.

A. E. **Hageboeck,** Secretary-Treasurer, Frank Foundries Corporation, Moline, Ill.

W. J. **Nugent,** President, Nugent Steel Castings Company, Chicago, Ill.

THE 1927 CONVENTION

The Program and Papers Committee of the American Foundrymen's Association announces preliminary plans for the technical and shop sessions for the 1927 Convention to be held at the Edgewater Beach Hotel, Chicago, the week of June 6. The tentative program calls for the following sessions:

June 6—Registration and Committee Meetings.

June 7—Apprentice Training.
Discussion of training methods pursued by shops operating successful apprentice courses.
Foundry Refractories.
Discussion of refractories.

June 8—Non-ferrous Shop Practice.
Discussion of gating and other shop problems.

June 9—Foundry Costs.
Conference on the local group method of securing uniform cost accounting methods for foundries.

June 10—Plant Visitation.

SAND GRADING

There has been a growing sentiment among sand producers and foundrymen that a uniform method of grading foundry sands would be of advantage to all concerned. While nearly every producer has for years graded his sands in one manner or another, the systems employed have differed so widely that there has been confusion when discussing grades of sands with different producers. With a view to remedying this difficulty and providing a standard system of grading sands, the Executive Committee of the Joint Committee on Molding Sand Research, late in 1924, created a Sub-Committee on Grading composed of representatives from the foundrymen and sand

producer groups. This sub-committee considered the various systems in use, compiled and examined a great mass of data on sands under production, and, after two years of work and numerous committee meetings, presented a report at the 1926 Detroit meeting of the A. F. A. in which it recommended practical methods for grading or classifying foundry sands as regards their fineness and clay contents. These methods were approved by the Executive Committee of the J. M. S. R. C. and in December, 1926, were approved as tentative standards by the Board of Directors of the American Foundrymen's Association.

It is hoped that these methods of grading or classifying sands will be employed by foundrymen, sand producers and others throughout the country. It is recommended that foundrymen grade the sands they are using according to the system outlined and that the A. F. A. grade numbers be used wherever practical; also that sand producers and sales organizations grade their products according to the same system and offer them under their A. F. A. grade numbers. Inasmuch as the present classification covers grain fineness and clay content only, further descriptive terms should be added, such as producers' name, locality in which produced, trade name and other characteristics. A graphic representation of the screen analysis is highly valuable in visualizing the grain distribution.

The grain fineness number, grain fineness classification and clay content classification are shown in a circular which can be obtained from R. E. Kennedy, 909 W. California Street, Urbana, Ill.

AMERICAN WELDING SOCIETY

HEADQUARTERS, 29 W. 39TH STREET, NEW YORK

The American Welding Society will hold its Eighth Annual meeting at the above address on April 27, 28 and 29, 1927. The program can be obtained from the Secretary.

BRASS MANUFACTURERS

HEADQUARTERS, 35 EAST WACKER DRIVE, CHICAGO, ILL.

Headquarters of the National Association of Brass Manufacturers were changed on March 1 from 139 North Clark street, Chicago, to the 31st floor, Pure Oil Building, 35 East Wacker Drive, Chicago.

AMERICAN ZINC INSTITUTE

HEADQUARTERS, 27 CEDAR STREET, NEW YORK

The 1927 annual meeting of the American Zinc Institute will be held in St. Louis, Mo., at the Hotel Statler on April 18 and 19. Reservations should be made through Ralph M. Roosevelt, chairman, Hillsboro, Ill.

AMERICAN ELECTROPLATERS' SOCIETY

NEWARK BRANCH, A. E. S.

HEADQUARTERS, CARE OF ROYAL F. CLARK, 55 SEYMOUR AVE.

The Newark Branch will hold its 9th annual banquet on Saturday, April 30, 1927, at Atchel-Stetter's Hall, Newark, N. J. An educational session will be held in the afternoon beginning at 3 P. M. Oliver J. Sizelove, chairman of the Educational Committee, has to date 9 papers promised for the session. George Reuter is chairman of the Banquet Committee, with George Onksen and Horace Smith as assistants. Royal F. Clark is secretary-treasurer; assistants, George Wagner and Fred Groh; Roy Stout, chairman of Publicity Committee. Tickets will be $3.00 per person and, as usual, the ladies will be welcome. Dancing will follow the Banquet.

NEW YORK BRANCH, A. E. S.

HEADUARTERS, CARE OF J. E. STERLING, 2595 45th STREET, LONG ISLAND CITY, NEW YORK

The New York Branch of the American Electro-Platers' Society held its regular meetings at the World Building, Park Row, New York, March 11 and 25, 1927. The meetings were very well attended.

On March 11, cleaning problems were discussed. At the same meeting, Joseph Haas gave a very interesting talk on silver plating stainless steel knives and some of the other problems encountered in silver plating tableware.

On March 25, the meeting was given over to a discussion on arsenic black and black nickel solutions.

BRIDGEPORT BRANCH, A. E. S.

HEADQUARTERS, CARE OF R. J. O'CONNOR, 1228 NOBLE AVENUE

The Bridgeport Branch of the American Electro-Platers' Society intend holding their Tenth Annual Banquet at the Stratfield Hotel in Bridgeport, Conn., on Saturday, April 23, 1927. An educational session will take place at 2:30 p. m. An elaborate educational program will be offered.

INTERNATIONAL FELLOWSHIP CLUB

HEADQUARTERS, CARE OF R. J. HAZUCHA, 1115 W. WASHINGTON BOULEVARD, CHICAGO, ILL.

The International Fellowship Club held a very successful meeting on January 29, 1927, at the Palmer House, Chicago, Ill., at which meeting 30 members were present. After a very nice luncheon various recommendations for the annual meeting in Toledo were proposed.

The International Fellowship Club again met in New York on February 19, 1927, at the Aldine Club, at which meeting there were also 30 members present. The Code of Ethics came up for discussion and the New York meeting practically made the same recommendations as the Chicago meeting. Very likely the proposed recommendations will be adopted at the Toledo meeting, which will be held in the form of a luncheon on June 27, 1927. The members will be notified of the exact time and place.

AMERICAN ELECTROCHEMICAL SOCIETY

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK

The Spring Meeting of the American Electrochemical Society at the Benjamin Franklin Hotel, Philadelphia, Pa., April 28, 29 and 30, 1927, will celebrate the twenty-fifth anniversary of the Society. Members are urged to make early reservations, since the program is of unusual interest and a very large attendance is anticipated.

More than fifty papers have been received for the meeting. A number of these papers will be of especial interest to the members of the Electrodeposition Division.

The Electrodeposition Division of the Society will meet on Saturday morning, April 30th. Among the papers to be presented are two very important communications, one from the laboratories of the Anaconda Copper Company, and the other from the Baltimore Copper Refinery, which is the largest of its kind in the world. Here will be reported for the first time detailed results on the behavior of the copper electrolyte under varying conditions of temperature, acidity, and copper concentration. There have been very marked changes in the refining of metals within the last few years, and the papers by S. Skowronski and E. A. Reinosa, of the Anaconda Company, and E. W. Rouse and P. K. Aubel, of the Baltimore Copper Refinery will discuss the new methods now being used.

S. Sonoda, of Kyoto, Japan, has carried out investigations for the production of rolled copper sheet, starting with regular electrolytic sheet, without intervening melting. Mr. Sonoda believes that when the process is properly carried out, copper sheet can be made more cheaply than by the older

processes. Another contribution from Japan, by G. Fuseya and M. Nagano, deals with the effect of addition agents, in particular crystalloidal addition agents.

Messrs. J. W. Shipley and Chas. F. Goodeve have investigated alternating current electrolysis and the electrolytic capacity of metallic electrodes. This is a most fascinating subject and holds out great promise.

A. Kenneth Graham, formerly with the Bureau of Standards and now with the Hanson & Van Winkle Company, will outline briefly the underlying principles governing the proper bright dipping of metal. The crystal structure of electrodeposited chromium has been studied with the aid of X-rays at the Bureau of Standards. This is a very timely subject and will be discussed at length by Frederick Siller, Jr. of the Bureau. C. T. Thomas and Dr. Wm. Blum, also of the Bureau of Standards, will present their second report on the Protective Value of Nickel Plating. A third communication from the Bureau, by Dr. Blum and H. S. Rawdon, deals with electrolytic corrosion.

Prof. A. L. Ferguson, of the University of Michigan, well known for his researches in electrochemistry, has investigated the transference numbers and activities of sodium hydroxide in aqueous solutions, and will report upon the interesting results obtained. A contribution from the University of Wisconsin, by Prof. Louis Kahlenberg and S. J. French, deals with the electrode potential of aluminum in aqueous solutions.

WASTE MATERIAL DEALERS

HEADQUARTERS, TIMES BUILDING, NEW YORK

The National Association of Waste Material Dealers held their 14th Annual Meeting in New York, March 15-16, 1927. The meeting was one of the best attended in recent years.

METAL DIVISION MEETING

A meeting of the Scrap Metal Division was held on Tuesday at 2:30 P. M., Mr. George Birkenstein, Chairman, presiding.

There was a discussion of the classification of scrap metals, and it was thought advisable to have a new classifiction committee appointed to go over the entire classification and make revisions in line with current conditions. The committee appointed to take up this work consisted of Mr. Nate Harris, Mr. Henry Lissberger, Mr. David Feinburg, Mr. Henry Levitt and Mr. Hans Green.

Mr. George Birkenstein was re-elected as Chairman of the Division for the ensuing year.

LIGHTING EQUIPMENT ASSOCIATION

HEADQUARTERS, 420 LEXINGTON AVENUE, NEW YORK

The office of the Artistic Lighting Equipment Association has been moved to New York City and they are now located in Room 711 of the Graybar Building, 420 Lexington Avenue; Telephone—Lexington 7340 and 7341.

FOREMEN'S ASSOCIATION

HEADQUARTERS, 1249 U. B. BUILDING, DAYTON, OHIO

The fourth annual convention of the National Association of Foremen will be held at Cincinnati, Ohio, on Saturday, May 21, 1927. The entire day's program will be held on the grounds of the Cincinnati Zoo.

A barbecue dinner will be served at noon and a banquet at 6 P. M. An invitation is extended to all Foremen and Superintendents of the industries of the United States and to any others interested in better foremanship

Registration fee, including meals, $4.00. Reservations for the meals should be sent to E. H. Tingley, Secretary, 1249 U. B. Building, Dayton, Ohio.

NATIONAL SAFETY COUNCIL

HEADQUARTERS, 108 E. OHIO STREET, CHICAGO, ILL.

When delegates to the Third Annual Eastern Safety Conference gather at Newark, N. J., April 27, a large contingent from the metal industry is expected to attend. In the long and varied program, of particular interest to these men is a speech by Stanley Coleman, Assistant Superintendent, Elizabeth Foundry Company, Elizabeth, N. J., on "Safety in Foundry Operations." Many additional features outside the metal industry but not outside the interests of any laboring for safety will be presented. A. R. Bush, Plant Superintendent, Barber Asphalt Company, Maurer, N. J., will talk on a matter of immense importance to many attending—"Safety in Small Plants."

The showing of "What Price Recklessness," a public safety film, and a banquet at 6:30 P. M. complete the day's activities.

Although the conference is being held under the auspices of the Newark Safety Council, attendance from States outside of New Jersey is expected. Vital problems are to be discussed.

Personals

DR. COLIN G. FINK

Dr. Colin G. Fink, head of the Electrochemical Department at Columbia University, and the inventor of a number of metallurgical processes, was born in New Jersey, December 31, 1881. He was educated in the New York city schools and graduated from Columbia University in 1903. Afterward he did post-graduate work in physical chemistry at the University of Leipzig until 1907 when he returned to the United States to go with the General Electric Company.

It was with this organization that he developed, in their laboratories, the commercial production of ductile tungsten for use in incandescent lamps. Later he worked out a substitute for platinum lead-in wires used in the lamps, consisting of an iron-nickel core coated with copper or copper oxide.

Dr. Fink later worked with the Chile Copper Company and developed an insoluble anode for their electrolytic refinery in Chuquicamata. This anode consists of a copper silicide and replaced ferro-silicon which introduced undesirable iron into the solution.

Dr. Fink is the inventor of the process for reclaiming old corroded art bronzes and is doing considerable work of this character for the Metropolitan Museum of Art in New York. With C. H. Eldridge, he worked out the Crodon method of electro-depositing chromium, this process now being exploited by the Chromium Corporation of America.

Dr. Fink is at the present time in charge of electrochemical work at Columbia University devoting his time largely to research problems and working with graduate students.

DR. COLIN G. FINK

Ed. J. Pfister, formerly of the Buffalo office of the Lincoln Electric Company, Cleveland, Ohio, has been transferred to the Philadelphia office.

Edward D. Gleason has been engaged by the United States Aluminum Company, Fairfield, Conn., to do experimental work in their foundry.

S. W. Shultz formerly of the Philadelphia office of the Lincoln Electric Company, Cleveland, Ohio, has been put in charge of the Lancaster office.

T. C. Eichstaedt has been appointed sales engineer by the Divine Brothers Company, of Utica, N. Y. He will cover Michigan and the middle western states.

Ernest V. Shaw has been elected secretary and a director of the Artistic Bronze Company, Bridgeport, Conn. A few months ago Mr. Shaw was made works manager.

C. S. Freeman, formerly in charge of the Lancaster office of the Lincoln Electric Company, Cleveland, Ohio, has been transferred to the Buffalo office and made district manager.

G. N. Bull formerly with the Worthington Pump & Machinery Company in their Washington, D. C., office, has been made district manager of the New York office of the Lincoln Electric Company, Cleveland, Ohio.

E. J. Clark, who has been with the Paasche Airbrush Company, as assistant sales manager for several years has been transferred to the New York Office of that company as sales manager of the New York District.

H. S. Gulick formerly superintendent of the brass foundry of the Ohio Brass Company, Mansfield, Ohio, is now engaged in a similar capacity at the Watertown, N. Y., plant of the New York Air Brake Company.

Frank J. Donnelly has joined the New York office of Botfield Refractories Company, Philadelphia, Pennsylvania, and will cover the New Jersey territory under the direction of Chas. C. Phillips, New York district manager.

Ben Friedman, was elected chairman of the Western division of the National Association of Waste Material Dealers at a meeting of the Chicago association on March 1, at Hotel La Salle, Chicago. Mr. Friedman is connected with the Metal Refining Company of Chicago.

William R. Webster has been appointed a member of the Main Research Committee of the American Society of Mechanical Engineers. Mr. Webster is president of the Automatic Machine Company, and vice-president of the Bridgeport Brass Company, both of Bridgeport, Conn.

Frank Jarosch has just taken charge of the Engineering Department of the S. B. R. Specialty Company, General Offices and Works, East Orange, N. J. Mr. Jarosch graduated in Europe as a Mechanical Engineer and has been continuously connected with the ball and roller bearing industry since 1907.

Keith D. Graham who in 1916 became connected with The Root Company, Bristol, Conn., in capacity of stock clerk has just been elected secretary of the company. Mr. Graham has been in charge of production of the Root plants for the last year or so. The Root Company manufactures automatic counters, hinges, butts, stampings, bottle openers, etc.

Stephen S. Tuthill, secretary of the American Zinc Institute, New York, will deliver an address before the St. Louis Chamber of Commerce, St. Louis, Mo., on April 20, 1927. This day will be designated as American Zinc Institute Day, and will be a part of a general St. Louis Convention. Mr. Tuthill will talk on some features of the zinc industry.

Edward M. Stephenson is returning to his former line, being now connected with Henry V. Walker Company, manufacturers of lacquers and enamels, 17 John Street, New York City. Mr. Stephenson will cover the New England territory where he was active for many years. Most of his business life has been spent in the lacquer industry, and he is one of the pioneers in its development.

A. V. Re has been placed in charge of the Department of Service and Research in plating or polishing by James H. Rhodes & Company, 157 West Austin Avenue, Chicago. Mr. Re has had twenty-five years of experience in this important field. He has installed plants and acted as "trouble shooter" in some of the largest cities in the country. For more than six years he was in charge of the plating and polishing department of a plant employing seven hundred and fifty men.

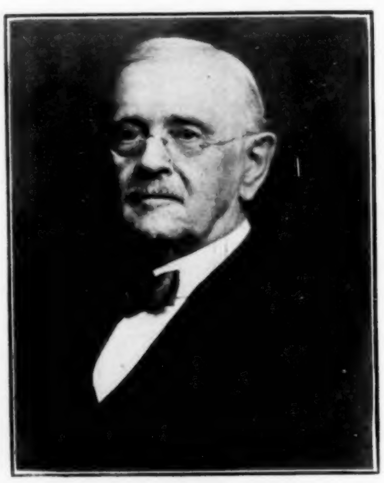
F. M. Malany, Singer Building, New York City, has been appointed representative in that district for the Stewart Die Casting Corporation, Chicago, manufacturers of die castings and bronze bearing metal. Mr. Malany was formerly Superintendent and Chief Engineer of the War Department in charge of operating and construction in the Canal Division and served as a captain in the Engineering Corps and was in active service in various parts of France. His engineering experience which covers a period of 18 years includes both operating and construction.

Obituaries

E. REED BURNS

E. Reed Burns, founder and president of the E. Reed Burns Manufacturing Corporation and E. Reed Burns & Sons, Inc. died at his home in Brooklyn, N. Y. on March 24, 1927 in his 72nd year.

Mr. Burns was born at Schodack Landing-on-Hudson, New York and came to New York City in 1872. His first business connection was with a storage warehouse. Following this he engaged in the produce business under his own name on West Street.



E. REED BURNS

Due to impaired health he went up to Massachusetts where he worked for a time at a mica mine. Returning to New York City he represented the Chester Mica & Porcelain Company gradually adding to the line sandpaper, quartz, and finally plating and polishing materials. His first shop was on Front street where he compounded polishing materials in 1888. In 1893 he moved the growing business to Brooklyn and built a three story building at 42 Withers street. This building was added to from time to time and now extends over to the next block 21-27 Jackson street. In later years he also established branch factories for the manufacture of polishing compositions in Chicago and Cleveland.

Mr. Burns was very active in religious work being connected with various Baptist organizations, both local and national.

In 1879 he was married to Carrie E. Harris who survives him, as well as three sons—Herbert R., Russell H., and Lloyd S. Burns and who have long been associated with him in conducting the business.

They will continue in the organization and maintain the high ideals on which the business was founded.

LUCIUS H. GOFF

Lucius H. Goff, said to be the world's oldest bellmaker, died in East Hampton, Conn., recently, after a short illness, at the age of 88. He was a lifelong resident of the city. Mr. Goff was employed by the East Hampton Bell Company for seventy-five years, serving as factory worker, superintendent, factory manager and salesman. He never lost a day because of illness and took but three vacations. He and Mrs. Goff celebrated their sixty-seventh wedding anniversary on January 1, 1927.

RICHARD S. CHISOLM

Richard S. Chisolm died February 12, 1927, at his home in New York. Mr. Chisolm was for some years president of the United Metals Manufacturing Company, Norwich, Conn.

NEWS OF THE INDUSTRY

Industrial and Financial Events

MUELLER BRASS REORGANIZATION

The purchase of the controlling interest in the Mueller Brass Company by Oscar B. Mueller, president, from the Mueller Company, Decatur, Illinois, was announced at the annual stockholders' meeting held March 15, 1927, at Port Huron, Michigan. Mr. Mueller has disposed of his interests in Mueller Company of Decatur, and Mueller, Limited, Sarnia, Ontario, and is no longer connected with those concerns. Robert and Philip Mueller, of Decatur, will continue as stockholder and director of the Mueller Brass Company.

The Port Huron mill will immediately start on a two-year expansion program, involving an expenditure of over $500,000 for plant extensions and new equipment. There will be no changes in policy of this company, which will continue to manufacture brass rod, brass and copper tubing, brass forgings, castings and screw machine products and brass specialties.

1926 was the company's most successful year. Shipments totaled over $6,000,000, an increase of 25 per cent over the previous year. The company now has bona fide orders on its books amounting to over $1,500,000. This is a quarter of a million dollars more than it has had at any time in its history and is equal to three months' business; 900 are employed in all departments, which are running full time with night shifts in some departments. The company expects 1927 to be equal to or better than the previous year.

GENERAL ELECTRIC REPORT

The annual report of the General Electric Company shows the year 1926 to have been the most prosperous in the history of the company.

Sales billed amounted to $326,974,104, compared with $280,290,166 in 1925, an increase of more than $36,000,000. The best previous high record was in 1924 when sales totaled $299,251,869.

Orders received during 1926 amounted to $327,400,207, an increase of eight per cent over 1925. The previous high record was $318,470,438 in 1920.

Profit available for dividends on the common stock on the 1926 business was $44,314,884, equivalent to $6.14 per share on the 7,211,481 shares of no par value stock outstanding, as compared with $20.49 per share in 1925 on the 1,802,870 shares of $100 par value common stock then outstanding, which is equivalent to $5.12 per share on the present stock. In August, 1926, four shares of no par value common stock were issued in exchange for each share of the old common stock.

A striking illustration of the company's contribution to the benefit of the consuming public and of its employes is contained in a statement showing that during the past twelve years, while commodity prices have advanced 54 per cent and the cost of living has risen 68 per cent, General Electric selling prices have increased but 13 per cent and the average earnings of the company's employes have more than doubled.

NEW FLOW METER COMPANY

A new Company was formed, known as the Bailey Meter Company, and on April 1, 1927, acquired the flow meter business and patents of the General Electric Company, and the fluid meter and combustion control business and patents of the Bailey Meter Company. Payment for the flow meter business and patents will be made to the General Electric Company in stock of the new Company, of which the other principal holder will be the Babcock & Wilcox Company, boiler manufacturers.

The new Company will have its factory and general offices in Cleveland, Ohio.

E. G. Bailey is president of the new company. R. S. Coffin is vice-president in charge of administration and finances. R. E. Woolley is vice-president in charge of engineering and sales. The new Bailey Meter Company will offer its customers a complete line of flow meters, boiler room instruments and combustion control equipment.

NATIONAL LEAD DIVIDEND

Preparatory to the declaration of a stock dividend, directors of the National Lead Company, New York, recommended to stockholders an increase in the authorized capital stock from $50,000,000 to $100,000,000. Edward J. Cornish, president, disclosed the plan in the annual report for 1926 and explained that the directors were convinced that "a reasonable increase in the dividend rate on the common stock can now be made and permanently maintaied."

Net earnings for 1926 almost doubled those of 1925, amounting, after taxes and reserves, to $9,004,567, equal after preferred dividends to $35.33 a share on the $20,655,400 of common stock outstanding. These earnings, the largest on record, compare with $4,633,352, or $14.17 a share, in 1925. With the net earnings on the insurance reserve added, the total income for 1926 is increased by $353.220 to $9,357,787, or $37.04 a share on the common.

UNITED SMELTING REORGANIZED

The United Smelting & Aluminum Company, Inc., New Haven, Conn., has been reorganized. The following officers were elected at a meeting held on March 28, 1927. President and treasurer, I. Harry Lavine; vice-president and assistant treasurer, Benjamin Slade; secretary and general sales manager, Milton E. Rosenthal.

The following were elected directors: I. Harry Lavine, Benjamin Slade, Milton E. Rosenthal, Marcel Blanc, Abraham Weissman. Mr. Lavine is a New Haven business man. Mr. Slade is an attorney. Mr. Blanc, elected on the board of directors, is New York manager of the International Ores & Metals Selling Corporation, sales agents in this country for French aluminum. Mr. Rosenthal has been connected with the above corporation in their sales department for the past fifteen years. E. J. Myers, who has been connected with the mill since its establishment, will continue as works manager.

BRASS PLANTS CONSOLIDATE

The Bronze Metal Company, with headquarters at 30 Church street, New York, has acquired the business of the Brady Brass Company of Jersey City, the plant of the Magnus Metal Company in that city and the Southern Brass Works of Portsmouth, Va., all manufacturers of railroad bearings.

These purchases may be preliminary to a larger consolidation. It is reported that the More-Jones Brass & Metal Company of St. Louis, Eureka Brass Company, St. Louis, Damascus Bronze Company, and Keystone Bronze Company, both of Pittsburgh, will be included in another consolidation which will eventually be taken into a parent company together with the group now being operated by the Bronze Metal Company.

WILLIAMSVILLE BUFF COMPANY SOLD

W. Irving Bullard, New England banker and textile manufacturer, who is also interested in commercial aviation, added the Williamsville Buff Manufacturing Company of Danielson, Conn., to his interests, according to an announcement made today at his office, 80 Federal Street, Boston, Mass.

Mr. Bullard purchased the Buff Manufacturing Company from Harold B. Atwood, of Danielson, Conn., and will put it under the management of the E. H. Jacobs Manufacturing Company, of Danielson, Conn., and Charlotte, N. C., of which Mr. Bullard is treasurer and general manager.

OHIO BRASS PROFITS

The report of the Ohio Brass Company, Mansfield, Ohio, for 1926 shows a net profit of $2,501,656, after depreciation and Federal taxes, equivalent after preferred dividends to $8.23 a share earned on 288,387 shares of no par common stock. This compares with $2,200,151, or $7.19 a share earned in 1925. The increase amounts to $301,505, or 13.7 per cent.

ELECTRIC FURNACE DEMONSTRATION

On March 15, 1927, the Ajax Electrothermic Corporation held, at its plant in Ajax Park, Trenton, N. J., a demonstration of Ajax Northrup high frequency melting furnaces in operation. The demonstration consisted of the following:

250 pound steel melting furnace in which crucible was fixed; melting time, 20 minutes.

Rapid Steel Melting in No. 60 crucible which was removable for pouring.

Continuous Rod Heating. Demonstration was made on 1/4 inch iron rod travelling over 60 feet per minute and heated to any desired temperature below the melting point.

Laboratory Furnaces. Various types of oscillator furnaces were on display.

RESEARCH IN METAL COOKING UTENSILS

Dr. Edward R. Weidlein, director, Mellon Institute of Industrial Research, Pittsburgh, Pa., has announced the appointment of Dr. Erich W. Schwartze to the senior incumbency of the Institute's Multiple Industrial Fellowship on Cooking Utensils.

This Fellowship has been recently established for the purpose of making a comprehensive chemical and pharmacodynamic study of the effects of the corrosion of metallic cooking utensils during the preparation of foods therein. The investigation will cover the effect upon the animal body of the metal taken up by and ingested with the cooked food as well as the effect of the material of the utensil upon the food constituents, particularly the vitamins, during culinary, food-manufacturing and sterilizing operations. The researches will be conducted along the most approved scientific lines, and the results will be published from time to time as they become available.

Dr. Schwartze will be assisted by Frank J. Murphy, a Junior Industrial Fellow of the Institute who has been engaged in food and nutritional investigations since the completion of his professional education at the University of Pittsburgh (B. Chem., 1922).

PRIZE CONTEST IN CHEMICAL COMPANY

A contest, unusual in conception, has recently been participated in by employes of The Roessler & Hasslacher Chemical Company, New York. This contest was sponsored by Mrs. Elizabeth Roessler and Mrs. Elizabeth Hasslacher, the widows of the founders of the Company. Their interest in the welfare of the organization and employes manifested itself in the offer of one thousand dollars in cash prizes for the winning essays on the subject of "The Roessler & Hasslacher Chemical Company's Place In Industry."

The awards were made at the company's main office on Saturday, March 19, Wm. A. Hamann, president, officiating. The first prize winner was Carl Seiler, the company's representative at Baltimore. Milton Kutz, Manager of Sales, and Colby Dill, General Superintendent, awarded the prizes.

LINCOLN ARC WELDING PRIZES

The American Society of Mechanical Engineers has accepted the custody of $17,500 given by the Lincoln Electric Company of Cleveland, Ohio, to be awarded, under the rules of the competition, to those contributing the best three papers disclosing new information that will tend to advance the art of arc welding.

The purpose of this competition is to encourage improvements in the art of arc welding, the pointing out of new and wider applications of the process, or indicating advantages and economies to be gained by its use, as these latter will be the chief bases upon which the winning papers will be selected. The prizes will be awarded as follows: First prize, $10,000; second prize, $5,000; third prize, $2,500.

Address all communications to The American Society of Mechanical Engineers, Calvin W. Rice Secretary, 29 West Thirty-ninth street, New York.

PUBLISHING INDUSTRY SELF-GOVERNED

More than one thousand advertising men and women, publishers, circulation managers and editors, gathered on February 18, 1927, at a luncheon at the Hotel Astor to honor C. C. Harn, newly elected managing director of the Audit Bureau of Circulation, and Philip L. Thompson, new president of the bureau. Personal tribute to Mr. Harn, and praise for the work of the bureau, were the theme of many speeches.

"The Audit Bureau of Circulation, as I see it, is the real expression of self-government in business as opposed to the regulation of business by government," said Mr. Thompson.

"Through it we find seller and buyer agreeing upon standards with which to measure the product—in this case standards without help from outsiders.

"Why don't we hear of scandals in relation to the circulation figures of newspapers and magazines and the consequent grievances of advertisers, who have been cheated because they didn't get what they were told they were buying? Because here is a business that has set its house in order on its own initiative."

Business Reports of the Metal Industry Correspondents

NEW ENGLAND STATES

WATERBURY, CONN.

April 1, 1927.

E. W. Goss has been appointed assistant to the president of the **Scovill Manufacturing Company.** He is a son of **President E. O. Goss** of the company and has been employed in the purchasing department for several years. As Governor Trumbull's representative on the New England Governors' Conference he has been active the past two years in endeavoring to secure cheaper freight rates on coal for this section.

A surplus of workers was noted in Waterbury during February, according to the Federal Department of Labor. Its report of this city states: "Part time schedules continued during the month in some of the plants creating a surplus of workers. Building is dull."

Loss of $2,000 was sustained by the **Scovill Manufacturing Company** from a fire which badly burned part of the interior of the recreation building of the plant early in the morning of March 7. The fire started in the bowling alleys. It was discovered by a watchman and firemen prevented it from spreading to other parts of the six-story building.

Gustave Hindenberg, an electrician's helper, was instantly killed at the **Chase Metal Works** plant, March 9, when his clothes became caught in the machinery of an electric crane. He had been working on the track of the crane and stepped aside to let it pass but did not move far enough.

Waterbury has been chosen as one of the principal manufacturing cities in the United States to be visited by a delegation of manufacturers of Australia, the local Chamber of Commerce has been notified. They will arrive here about the 23d.

E. T. Ingham, sales manager of the American Brass Company, has been named as chairman of the committee which is arranging a quality home progress exposition under the auspices of the Chamber of Commerce for the latter part of this month. Others on the committee include: **E. O. Goss**, president of the Scovill Manufacturing Company; **John A. Coe**, president of the American Brass Company; **H. B. Dow**, secretary of the Waterbury Clock Company; **R. S. Booth** of Berbecker & Rowland Company, and **J. M. Burrall** of the American Ring Company.

Practically wholesale thefts from the Scovill Manufacturing Company of silver flasks, cigaret lighters and vanity cases have been stopped, it is believed, by the arrest of Frank Longo, James Mobilio and Anthony De Angelo, employes of the Company, in whose rooms large quantities of the loot were found.

A certificate of incorporation has been filed with the Secretary of State by the **Madison Tool Works, Inc.**, of this city.

The company will manufacture and deal in metal articles, novelties and machinery. It has an authorized capital of $50,000 and will start with $10,000 paid in. The incorporators are Ferdinand E. Veillette, Nellie T. Veillette and Martin J. Hanlon.

Nearly 2,000 employes attended the **American Brass Company's** social at the Y. M. C. A., March 16. Sports and dancing were enjoyed. John A. Coe, president of the company, made the opening address. Two swimming teams and a gym team gave exhibitions in addition to the informal sports.

The **Chase Girls' Club** and the **Chase Foremen's Association** held an entertainment and dance in the Chase Company recreation rooms on St. Patrick's Day.

Among local patents granted during the month are the following: George A. King, F. E. Warner and E. H. Tompkins, assignors to the Scovill Manufacturing Company, mechanism for setting carpet fasteners; C. P. Cook, a metal vanity case; Thomas Baker, assignor to the Chase Companies, Inc., a combined metal and fiber gasket; Abram Pasman, assignor to the Scovill Manufacturing Company, waste pipe fitting.—W. R. B.

BRIDGEPORT, CONN.

April 1, 1927.

Warren **D. Blatz** of the **Bridgeport Brass Company** was elected president of the Bridgeport Sales Managers Association formed here at a meeting March 10 of 28 sales managers of local factories. The purpose of the organization is for the exchange of ideas, to obtain a better knowledge of the products of the city and to promote a more progressive spirit in local industries. Other officers elected are: Vice-President, John W. Bray of the Bullard Machine Tool Company; Treasurer, W. B. Harrington of the International Silver Company; Secretary, Alpheus Winter of the Manufacturers Association.

The Federal Department of Labor reports that a slight general surplus of labor exists. All plants are running but not all are running full time.

A settlement has been reached between the city and the Bridgeport **Brass Company** in the matter of the appeals of the company from the assessments levied against it in 1922, 1923, 1924 and 1925. By the settlement the total of assessments for the four years have been reduced $4,281,305. This means that the amount of tax for the four years has been reduced about $120,000. The appeals had been taken to the superior court but the company reached a compromise settlement with the city officials. As a result of the settlement, $200,000 in taxes was paid during the past month, which ended the entire controversy.

Company officials and managers of the various plants of the General **Electric Company** met at the local plant March 15 for a business meeting and inspection. President Gerard Swope, Vice-Presidents, G. E. Emmons, E. W. Allen and H. F. Erben, and Works managers of the plants at Schenectady, Lynn, West Lynn, Fort Wayne, Erie, Bloomfield, Cleveland, Philadelphia, Baltimore and Harrison, N. J., attended.

The **Remington Arms Company** was host to 100 members of the Fairfield County Fish and Game Association, the 16th. Seth Wiard of the sales promotion department addressed the sportsmen on the history of ammunition. Inspection of the plant followed.

The **International Silver Company,** with factories here, in Waterbury, Meriden, and Wallingford, in its report for last year just made public shows a net income of $1,470,647 after taxes, depreciation and interest, equivalent after the regular 7 per cent dividend on preferred stock to $17.24 a share on the 60,798 shares of common stock. This compares with $969,317 net income for 1925.

Earl **F. Siemon,** president of the **Siemon Company,** has been elected a director of the Bridgeport Trust Company and a director of the Bankers Capital Corporation of New York.

One thousand and fifty employes of the **American Tube &** Stamping plant of the **Stanley Works** have raised $1,112 as their contribution to the Employes Tuberculosis Relief Association.

Among patents granted during the month to local inventors are the following: George R. Brown, electric fuse; Harry E. Gilbert, still; Gilbert Goodridge, attachment plug and receptacle; George B. Thomas, rotary snap switch; Rollie Fageol, assignor to the American Chain Company, multibar bumper; Henry Grenier, graphophone needle; William W. Trinks, laundering machine; Anker Lynne, vanity case. The patent office has also registered a trade mark of the Bridgeport Brass Company on metallic wire and rods.

The Bridgeport sales force of the **Remington Cash Register Company** was tendered a victory dinner last month by M. J. McGreal, divisional manager, for having won the yearly sales cup by leading in sales for the year.—W. R. B.

STAMFORD, CONN.

April 1, 1927.

The **Yale & Towne Manufacturing Company** reports for 1926, net profits, after depreciation and taxes of $2,527,754, equal to 25.27 per cent on the $10,000,000 outstanding stock and comparing with 27.70 per cent in 1925 and 20.18 in 1924. The surplus at the end of the year was $9,524,046. Trade marks and good will, carried for years at $2,000,000, was marked down to $1 this year. The current assets were $13,718,364 and current liabilities $1,461,653 at the end of the year, leaving net quick assets of over $12,000,000 compared to $10,000,000 at the end of 1925.

All plants in Stamford are running and the rolling mills are on overtime scehdules, according to the report of the Department of Labor, the only slackness noted being in the building trades due to the usual seasonal slowing up and resulting in a surplus in that type of labor.—W. R. B.

NAUGATUCK VALLEY NOTES

April 1, 1927.

TORRINGTON—An extrusion machine at the plant of the American Brass Company here broke down March 18, necessitating the transfer of the employes of that department to the Ansonia plant of the company until the machine could be repaired. It is the only machine of its kind in Torrington and the repairs are expected to take some time. Extruded products usually made here will be turned out in Ansonia until the repairs are completed.

The Department of Labor February report says of Torrington: "All plants are running and there is very little unemployment evident. Resident craftsmen are fairly well engaged with building construction."

NEW BRITAIN—John P. Elton of Waterbury and **Harris Whittemore** of Naugatuck were added to the board of directors of the **American Hardware Corporation** at the annual meeting here last month. Besides these two and John B. Minor, of Plainville, the directors include: President, George T. Kimball; Vice-Presidents, Charles B. Parsons, B. A. Hawley, Albert N. Abbe, George P. Spear, and Charles H. Baldwin; Treasurer, Isaac D. Russell; Assistant Treasurer, William H. Booth; Secretary, George Hildebrand; Assistant Secretary, Joseph C. Andrews. The Company paid dividends of $2,976,000 during 1926 and on January 1, 1927, had a surplus of $13,010,105.

A surplus of common labor it reported here during the month of February, according to the Department of Labor. A slight improvement has occurred in some plants and operating time is being increased.

The **P. and F. Corbin Company** has issued an announcement that all young women office employes who marry must give up their positions at the plant so that available positions may be provided for girls leaving school and those whose employment is needed for the support of their families.

HARTFORD—All plants here are running full time except a few that have been operating on a 45 hour week schedule for some time. The metal working trades are operating at capacity and there is a shortage of skilled craftsmen in this line.

BRISTOL—With the exception of a slight surplus of unskilled labor, resident workers are well employed. One of the largest local plants increased its working quota during February and resumed full time operations.

DERBY, ANSONIA, SEYMOUR and SHELTON—A slight seasonal recession in industrial activities was noted here during February. All plants are operating but not all work with full working quotas.—W. R. B.

MIDDLE ATLANTIC STATES

TRENTON, N. J.

April 1, 1927.

Business conditions show little improvement in the metal industry, but manufacturers believe when the weather becomes more settled work will be more plentiful. Poor business conditions are shown in the number of unemployed men who are seeking work. Contracts have been let for considerable building and when this work has been started it will cause a jump in the metal industry.

The United Clay Mines Corporation, of Trenton, N. J., has filed a formal complaint with the United States Commerce Commission seeking a refund in freight rates. The complainant alleges that overcharges of $72.09 were assessed in the shipment of a carload of excavating machinery shipped from Toledo, O., to the United Clay Mines Corporation at Hawthorne, Fla. The Commission is asked to find that an improper rate was charged and that a refund of $72.09 is due.

The **Duncan Mackenzie Sons Company** has purchased a large portion of the property formerly owned by the Bordentown Forge and Machine Company, Fieldsboro, N. J. The Mackenzie Company will occupy the former Forge building, a structure over 200 feet in depth and 60 feet wide, with the adjoining large machine shops in a two-story brick building.

The **Fleron Manufacturing Company,** of 5 and 7 High Street, Trenton, has been incorporated with $10,000 capital to manufacture electrical radio, hardware and household specialties. The owners of the new company are Frederick J. Fleron, Joseph Bradbury and Clarence J. Appleget.

Following concerns were incorporated here: **Clinton Manufacturing Corporation,** Camden, N. J., manufacture brass valves, 50,000 shares no par; **Acme Automotive and Battery Service Company,** Camden, N. J., batteries, Camden, N. J., $50,000; **Campbell Manufacturing Company,** Long Branch, N. J., electrical machinery, $100,000; **Karle Thermometer and Instrument Company,** Passaic, N. J., 1,000 shares no par; Hill City Battery and Ignition Service, Inc., Summit, N. J., $125,000.—C. A. L.

NEWARK, N. J.

April 1, 1927.

The United States Court of Appeals will decide whether the New Jersey Federal District Court or the New Jersey Chancery Court shall adjudicate in the matter of the **Garod Corporation,** manufacturers of radio equipment, against which receivership proceedings are pending in both courts. The Universal Stamp and Stationery Company, the complainant in the Chancery Court suit, will ask the higher court to decide which court shall have jurisdiction. The appeal will be taken from Federal Judge Runyon's refusal to dismiss the equity receivership proceedings brought in the Federal Court immediately after the other suit had been started in Chancery Court.

Vice-Chancellor Backes has appointed Alexander Bassin receiver for the **Feizenberg Lighting Fixture Company,** of 652 Bergen Street, Newark, and directed creditors and stockholders to show cause why the receivership should not be made permanent. The application, which was made for Samuel Feizenberg, president of the company and a creditor for $1,200, states that the concern ceased to do business because of lack of funds. Assets are declared to be more than $6,000 and liabilities approximately $1,000. The company was incorporated January 18, 1926.

Following Newark concerns bave been incorporated: **United States Blade Corporation,** razor blades, $100,000 preferred stock; **Apex Alloy and Smelting Company, Inc.,** refining metals, $100,000; **Howard Plumbing Supply Company,** manufacture plumbing supplies, $300,000; **Western Screen Company, Inc.,** manufacture screens, $100,000.—C. A. L.

MIDDLE WESTERN STATES

DETROIT

April 1, 1927.

A representative of the Metal Industry, Tuesday morning, March 29, interviewed officers of both the **Detroit Copper and Brass Rolling Mills** and the **Michigan Copper & Brass Company,** at Detroit, and both denied emphatically the rumors current that these two great organizations had been, or were about to be, purchased by the **American Brass Company.**

Mr. Barrett, treasurer of the Michigan Copper & Brass Company, was most emphatic in denying that anything of the kind was contemplated. He closed the interview by stating that such rumors made him tired. They have been in circulation for weeks, he said. They are just gossip with no foundation whatever. Practically the same expression came from the treasurer of the Detroit Copper and Brass Rolling Mills.

According to **K. D. Cassidy,** a metal expert, the demand for scrap continues to show but little change in this territory. Current requirements are more or less nominal and aggregate tonnage being moved is small. The outlook, he says, is considered somewhat more favorable, however, than it has been at any time since the beginning of the year. Inquires are being received in greater number indicating somewhat increased interest on the part of consumers and promising buying before the end of the month. Demand for scrap aluminum, he says, continues fairly steady and prices are firm.

Wire screens for the Detroit Zoological Park, at Royal Oak, will be installed by the **Art Brass & Wire Works.** Donaldson & Meier, Detroit, have the plans.

The **McCord Radiator & Manufacturing Company** for the year ending December 31, 1926, shows a net income of $723,041, after interest, depreciation, federal taxes and reserve, equal to $18.84 a share on the 38,250 no par shares of Class A stock outstanding in 1925. The company, it is stated, has outstanding 38,250 no par shares on Class A stock and 150,000 no par shares of Class B stock.

J. F. Getty, district manager here of the **Standard Manufacturing Company,** announces the perfection of a new enamel for plumbing fixtures. This new finish, he states, will withstand the action of food acids, and keeps its luster, no matter how often it is subjected to minerals in water or the ingredients in cleansers. It is more durable and harder, he says, than any similar product ever used on plumbing fixtures.

Glen H. Waid, for the last 12 years factory representative of the **Scott Valve Manufacturing Company,** Detroit, has resigned to accept a similar position with the **William Powell Manufacting Company,** of Cincinnati, in the State of Michigan, with headquarters in Detroit.

O. D. Edinger, of Wyandotte, Mich., has been awarded the general contract for the construction of the factory building for the Detroit Brass and Malleable Company, to be erected at Wyandotte. Harry S. Angell is the architect.

The **Reo Motor Car Company,** at Lansing, has eighteen thousand gallons of enamel as its working supply in its enameling plant only recently completed. This big supply is kept in constant movement by pump circulation, so that it will remain at a constant consistency. From the main supply the enamel is pumped into three vats of 5,130 gallons capacity on the floor above. On this floor there are also three electrically heated and controlled drying and baking ovens. A moving endless rack carries the unfinished metal automobile parts from the ground floor enamel vats to the ovens, in a continuous process. After they have been carried through the first vats, the parts are conveyed to the first drying oven, where the enamel is baked hard. Then they move forward through the second and third vats and ovens alternately, being divided finally at the main factory entrance, covered with three coats, hard smooth enamel.

The **Port Huron Brass Company** has recently been incorporated at Port Huron, Mich. It will manufacture and sell brass and copper.—F. J. H.

MILWAUKEE, WIS.

April 1, 1927.

The **Racine Polishing & Plating Company,** Racine, Wis., was recently incorporated for $25,000. The incorporators of the company are: Fred Hau, and Gilbert Brach, of Racine, and Jacob Hay, of Kenosha.

The **Metal Products, Inc.,** of Milwaukee, Wis., which will manufacture and sell electric signs, has just been incorporated. Charles Wamser, Richard von Zakobiel, and Frank W. Wamser are the incorporators.

Announcement has just been made of the incorporation of the **Union Roofing & Sheet Metal Company,** Milwaukee, Wis. The incorporators of the company, which will manufacture and sell ornamental sheet metal work, are Max Friedman, Jack Niederkorn, and Charles Wolf, all of Milwaukee.

The **Acme Mill & Foundry Supply Company,** 4409-11 Watertown Plank Road, Milwaukee, Wis., has been incorporated for $10,000. Harry Pokrass, Louis Smoller and Phineas Smoller, all of Milwaukee, are the incorporators.

The **Badger Sheet Metal Company,** located at 620 S. Broadway, Green Bay, Wis., has grown during the four years it has been in existence from a small concern with only its two founders as the working crew to a company employing fourteen men, and which during the past year installed more than 150 furnaces in Green Bay and vicinity. Business during the fore part of 1927 has shown a substantial increase over that of the corresponding period of 1926, according to the members of the firm. While the heating jobs make up the largest part of the company's business, much roofing, eaves-troughing, and sheet metal work of all kinds is being taken care of at the present time.

Officials of the **Apex Fabricating and Manufacturing Company,** of New York, have announced that they will move their plant to Three Lakes, Wis. The chief product of the company, which will employ about 100 men, is aluminum ware. The company is a subsidiary of one of the National Chain Store Systems, through which its entire output is distributed.

Thomas E. Highley, sales representative of the Aluminum Goods Manufacturing Company, of Manitowoc, died in Oklahoma City, Oklahoma, recently. Mr. Highley, who has been connected with the local concern for the past six years, is survived by his wife and two small sons.—A. P. N.

CHICAGO, ILL.

April 1, 1927.

The **National Nipple Manufacturing Company** has been incorporated at $20,000 with offices at 1400 W. 40th St., Chicago, Ill. The firm will manufacture nipples and steel, iron, brass and copper pipes. It will also do cutting, threading and bending steel, copper and iron pipes, etc. The incorporators are Charles J. Gallagher, Earl L. Cook, Joseph Stech and Frank F. Tollkuehn.—A. P. N.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

March 18, 1927.

Metals played an important part in the British Industries Fair recently held in Birmingham. The Fair was the biggest ever held in the British provinces, and it is estimated that £4,000,000 worth of orders were placed. Non-ferrous metals were exhibited in immense variety and in every conceivable shape and size, and special alloys were a great feature. Many of the firms exhibiting were prominently associated with the Midland area, but a good proportion of the leading houses in other parts of Britain were represented. Brass and copper tubes and pressings and stampings were very much in evidence and the electroplating plants were of exceptional interest. A practical demonstration of the electro-deposition of metals was shown at the stand of **W. Canning & Company,** of Birmingham. The working exhibit of a fully automatic electro-plating apparatus not only embodied practically every latest improvement in electroplating practice but enabled work to be successfully produced without any manual labor beyond hooking the articles on at one end and taking them off when finished at the other. As the work to be plated has to pass successively through all the preparatory cleaning and swilling vats, and finally through swilling and dipping out apparatus after deposition, careful and accurate design has been necessary. In carrying out the arrangement the various vats are placed in line one behind the other in their proper order. Two conveyor chains are arranged to move slowly over this line of vats. All the latest improvements for rapid, even and smooth depositing are embodied in the apparatus. The solution is heated by electric elements and an alternative heating system is exhibited for heating by steam coils. A combined agitating and filtration apparatus was fitted by which the solution is continually filtered free from suspended matter and kept in constant movement. The drying oven at the extreme end of the apparatus is gas-heated and thoroughly dries the articles after they have passed through the cold and hot swilling vats which follow the plating. The apparatus shown was 50 feet long by just over four feet wide.

The outlook in the brass foundry industry is hopeful as the trade is in a comparatively prosperous and healthy condition, while the overseas markets show signs of awakening. Much of the ornamental brass ware, particularly of the antique type exhibited at the Fair, reflected the high quality of British workmanship. Characteristic examples of cast brass goods and stamped brass wares were on view together with copper cooking utensils and decorative products. Among the firms showing copper and brass tube were Earle Bourne & Company, Ltd., H. H. Vivien & Company, Ltd., and Henry Wiggin & Company, of Birmingham.

There is a distinct lull in the Sheffield electroplate and cutlery trade. About 500 workers in the plate department are idle and about 1,500 in the cutlery section. Cutlery manufacturers report that business is poor and no revival has followed the usual lull experienced when Christmas trade is over. A number of firm, however, are benefiting from some special orders emanating from new London hotels which require plate and cutlery outfits in large quantities. A number of orders for the supply of electroplate and cutlery for the Irish Free State Army have been received by five Sheffield firms.—J. H.

Business Items–Verified

The **Chromium Corporation of America** has removed its general offices from 26 Broadway to 120 Broadway, New York.

The **Magnolia Metal Company** has moved its offices from 115 Bank Street, New York, to 75 West Street, New York.

The **National Lead Battery Company,** 1704-26 Roblyn Avenue, St. Paul, Minn., is reported to be planning the construction of a new plant in the New York district, during the coming summer.

The **Rossid Manufacturing Corporation,** 1000-1002 W. Church Street, Orlando, Fla., is installing a small plating plant. This firm is interested in literature and information covering equipment and supplies.

The **Bridgeport Brass Company,** Bridgeport, Conn., is arranging for expansion in connection with the manufacture of a recently perfected foot-controlled flush valve, to be carried out in its Building Materials Division.

C. F. Braun and Company, South Fremont Avenue, Alhambra, Calif., are erecting a new foundry. It will be 300 ft.

by 380 ft., and cost $115,700. This firm operates the following departments: brass machine shop, brass, bronze and aluminum foundry; tool room, grinding room.

E. F. Phillips Electrical Works, Ltd., Montreal, Canada, plans the construction of two wire and cable manufacturing buildings, one for cotton covering department and one for enameled wire department, in Brockville, Ont., Canada. This firm operates the following departments: copper rod mill; wire tinning.

The **Square D Company,** 6060 Rivard Street, Detroit, Mich., manufacturer of electrical equipment and devices, has awards a general contract to W .E. Wood and Company, for an addition to cost about $50,000 with equipment. This firm operates the following departments: tool room, plating, japanning, stamping.

Harold E. Trent Company of Philadelphia, Pa., has moved to larger premises at 439 N. 12th Street, Philadelphia. It is the intention of this company to develop large size metal pots and pot furnaces up to 1700° F., in addition to their standard line of metal melting pots up to 1500° pounds capacity and 1000° F.

The **Artcraft Metal Products Company,** Columbus, Ohio, stove manufacturer has purchased the plant of the Davies Glass Company, Martins Ferry, Ohio, where they are now located. The company is installing a complete porcelain enameling department with capacity for a considerable quantity of jobbing work.

The **Mesick and Mahy Manufacturing Company,** 1431 South Wall Street, Los Angeles, Calif., manufacturer of plated ware, silverware specialties, etc., will build a new three-story plant to cost about $50,000. This firm operates the following departments: spinning, brazing, plating, stamping, soldering, polishing, lacquering.

The **Billings & Spencer Company,** general offices and works at Hartford, Connecticut since 1869, have transferred J. H. Coyle, formerly Supervisor of Engineering, to be directly in charge of Sales Engineering in New York, Pennsylvania and New England. Mr. Coyle will primarily represent this Company on special contract forgings and drop forging equipment, such as drop hammers, die sinkers, etc. but may be called upon for engineering work in connection with any special drop forged tools. His headquarters will be at Hartford.

The **Billings and Spencer Company,** manufacturers of the "Triangle B" line of dropped forged tools, special forgings and forging machinery, with general offices and works in Hartford, Connecticut, has transferred Howard E. Oberg, who has had fifteen years practical experience in the forging industry embracing all departments, to be directly in charge of sales engineering for their complete machinery line in the Middle West, with headquarters in Detroit, Michigan. Mr. Oberg will be located in Room 5-251, General Motors Building, Detroit, Michigan.

The entire Sprague portable hoist business of the **General Electric Company** has been taken over by the **Shepard Electric Crane & Hoist Company** of Montour Falls, N. Y., according to a recent General Electric announcement. The change took place April 1, 1927. Sprague hoists have been built in the Bloomfield plant of the General Electric Company since 1903. The Shepard Company will continue the manufacture of this line and has established for this purpose a division known as the Sprague Hoist Division of the Shepard Electric Crane & Hoist Company, with offices at 30 Church Street, New York City. **N. A. Hall,** of the General Electric Company, will take charge of the new Shepard division, after 14 years of service with General Electric.

The **Merco Nordstrom Valve Company,** Oakland, Cal., has a new factory nearing completion at the corner of 24th and Peralta Streets, to be devoted exclusively to the manufacture of plug valves for various industries. Heretofore the valves have been made on the Atlantic seaboard and with two factories operating, the Company will be in a position economically to serve national trade. The Company is a subsidiary of the Merrill Company and officers include Charles G. Broadwater, President; Sven Johan Nordstrom, Vice-President; Herbert S. Shuey, Secretary and Treasurer, all of whom are directors of the Company; the other directors being Charles W. Merrill, and Louis D. Mills; the former president, and the latter, consulting engineer of the Merrill Company.

BUSINESS TROUBLES

In the District Court of the United States for the Eastern District of Pennsylvania, the **Electro-Sherardizing Company** was duly adjudicated bankrupt on March 2, 1927. Walter C. Douglas, Jr., 1015 Chestnut street, Philadelphia, Pa., is Referee in Bankruptcy.

The **Tolhurst Machine Works,** Troy, New York, announce that a man using the name of Cummings, Butler or Burton, has been representing himself as at present or formerly employed by that company. The Tolhurst company states that this man is an impostor as he is not nor ever has been employed by them, under the name Cummings.

INCORPORATIONS

Victor Metal Products Corporation, Brooklyn, N. Y., has been incorporated with a capital stock of $300,000 to $450,000. This firm will operate the following departments: tool room, casting shop, rolling mill, plating, stamping.

J. & G. Brass Company, 46 Paterson Street, New Brunswick, N. J., has been incorporated with capital stock of $200,000, to manufacture spring secured safety valves, appliances, etc. This firm will operate the following departments: brass machine shop, tool room, grinding room, plating, stamping, polishing.

The **Service Metal Supply and Manufacturing Corporation,** 1498 Fulton Street, Brooklyn, N. Y., has been organized with a capital stock of $200,000, to manufacture tinsmiths' supplies and do a jobbing business in tin plate, sheet iron and steel, metal lath and ceilings and non-ferrous rolled products. The officers are: Fred Weber, president; Louis Silberman, treasurer; W. J. Copplestone, vice-president, and E. Silberman, secretary.

Pennsylvania Stamping Corporation, York, Pa., manufacturing Pasco brand saws, toys, stamped metal specialties, and furniture casters, has been incorporated with a capital stock of $100,000. This corporation was purchased from the Receiver of the Pennsylvania Stamping Company. The officers are L. H. Rowland, president; Harry Stewart, vice-president; L. E. Swett, secretary and treasurer. This firm will operate the following departments: tool room, japanning, stamping, wood working shop.

East Toledo Aluminum and Brass Castings Company, 2602 York Street, Toledo, Ohio, has been incorporated with capital of $10,000, to manufacture brass, bronze and aluminum and are equipped for production work. The company has erected a new one-story castings plant on York Street. S. Nagy is president, secretary and treasurer. W. C. Manthey is superintendent, having been for the last 9 years with the Simplex Foundry and Machine Company, which he started, and of which he was the largest owner until it was taken over by the France Foundry and Machine Company. Louis Akos is office manager.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	..	$69	$70
American Hardware Corporation	$100	83	85
Anaconda Copper	50	46	46½
Bristol Brass	25	4	8
International Nickel, com.	25	42½	43
International Nickel, pfd.	100	105	106
International Silver, com.	100	159	160
International Silver, pfd.	100	114	115
National Enameling & Stamping	100	24¾	25¼
National Enameling & Stamping, pfd	100	80	82
National Lead Company, com.	100	193	195
National Lead Company, pfd.	100	127	129
New Jersey Zinc	100	190	192
Rome Brass & Copper	100	132	142
Scovill Manufacturing Company	..	59	62
Yale & Towne Mfg. Company	..	74½	75

Corrected by J. K. Rice, Jr., Co., 120 Broadway, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

April 1, 1927.

There were no changes noted in the brass and copper trade during March. The prices established on February 28th, remained fixed at that level for the entire month. Consumers continued buying in the same hand to mouth fashion which has been the vogue for some time and the mills all ran on a comfortable order book without any excitement due either to great activity or slow business. Some comments of a critical or complaining character were heard but all hands seem to be comfortably employed getting out the day to day orders.

Because of the refusal of consumers to accumulate any stocks even on the rising market, the conditions from this point of view remain sound in the industry. Practically all departments of the mills are running on orders for material intended for immediate consumption. Seasonal conditions and a slight recession in building activity have resulted in a small decrease in the sale of sheet copper but this is expected to be changed with the coming of steady open weather and spring building operations. Some very large contracts for brass pipe for plumbing work on new buildings have been placed and most of the mills are busy in that department.

The automobile business has been something of a doubtful element in the past month with some auto manufacturers issuing instructions to suspend shipments of radiator material. Whether this represents a falling off in the auto trade and production is considered doubtful and the situation is expected to clear up promptly. Any permanent reaction in this line would be quite a serious matter with many of the brass mills so the industry is being watched carefully and hopefully but without any great degree of anxiety as yet.

Offsetting this item is the fact that as March closes the refrigerator manufacturers have suddenly become active and telegraphic releases for brass, copper and monel metal have been sent out by the principal factors in this line. Since last Fall the refrigerator manufacturers have been taking very little new material from the mills. They have been working on their inventories using up the stock accumulated and waiting for developments before placing new business. Producers of Monel metal and copper have been waiting anxiously for a sign of renewed activity in the shape of new buying and it has finally come. The largest manufacturer of ice cream cabinets has placed new orders for upwards of a million pounds of Monel metal alone.

Monel metal consumption has been going on at a high rate without any of this business. Now that this line has been reopened the production will be placed on a basis greatly in excess of anything heretofore. Some heavy orders for Monel metal have been placed by various railroad companies for use in their dining car galleys. A number of new stores for Schrafft's and Huyler's are also being furnished with Monel metal kitchen equipment.

Metal Market Review

Written for The Metal Industry by R. J. HOUSTON of D. Houston & Company, Metal Brokers, New York

COPPER

April 1, 1927.

Conditions in copper were unusually quiet last month. Sales in the domestic market were on a restricted scale, with consumers rather well covered on nearby requirements and inclined to keep to hand-to-mouth buying for necessary purchases. Price variations were correspondingly small with quotations at the end of month 13¼c and possibly a shade below.

Transactions for European account were fairly active at times, but not consistently strong enough to give the market a forward impulse. The stock of inferior copper abroad has been reduced, and the supplies of electrolytic at foreign points are not considered a strain on the situation.

As for domestic consumption, the activity at manufacturing plants reflects a satisfactory and healthy condition despite some recession in other directions. Existing demands are absorbing the bulk of production here at home. World consumption, however, is at a rate unequal to the recent pace of output. Official figures for February show that surplus holdings or refined copper on March 1 were higher than at any time since the end of March 1925. Curtailment of output is now under way and that may possibly prevent serious market setbacks.

ZINC

Developments in zinc have served to give the market a setback and recent tone was weak. There has been further increase of stocks in smelters' hands so that the surplus supplies on March 1 amounted to 32,938 tons, against 29,912 tons on February 1, an increase of 3,026 tons. The deliveries in February were on a liberal scale, being 48,315 tons, but the statistical position is not such as to inspire general trade confidence in market values recently. Stocks are now more than double what they were less than six months ago. There is evident over-production of the metal, and the trade regards this as a bearish factor in the situation. Recent business was done at 6.60c, St. Louis basis, and further offers were made at same price. Reports of curtailment at smelting plants are expected to improve the statistical position in the near future. Consumers were active buyers during the past month, but conditions were quiet at the month end.

TIN

High prices continue to prevail for tin, and there are no immediate indications that the old time selling values of pre-war times will be restored again. Limited supplies, increased consumption here and abroad provides a solid basis for a strong situation in this metal. The manufacture of tin plate, solder and babbitt metal represent the major consuming industries using tin, and new high records of consumption will undoubtedly be established in coming years.

A succession of market fluctuations were recorded during the past month. Speculative operations played a conspicuous part in the price movements, both up and down, but the factors of supply and demand finally assert themselves as the dominant influences. An early change in the present position must come from a decrease in the scale of business activity or from an increase in production. The immense enhancement of price during the last half dozen years has resulted from a conspicuous increase in demand and a decided drop in supplies. During the last two years domestic deliveries of tin showed an increase of 13,925 tons, and in the same period world visible supplies were reduced 5,867 tons. There may be some increase in production and and a slight falling off in consumption during the current year, but the tin industry is in such fine balance that sensitive conditions are bound to characterize movements for many months. Spot Straits quotes 67½@68¼, with April delivery at 67¼@67¾c. Market steady.

LEAD

Active demand and higher prices for lead were features early in March. There were signs of somewhat irregular movements in the first half of month, but an advance in price had a stimulating effect on the buying for a time. The scale of market activity was not large enough, however, to hold prices at the 7.65c, New York basis and the result was a reduction to 7.55c by the leading producer. There was a further quick recession to 7.45c and another on March 30 to 7.35c, and this is the present quotation for New York delivery. Consumption is good and the immediate prospects also point to large requirements. The reduction in price slowed down buying, and the trade are inclined to limit operations to see if other reductions are to follow. There is discussion over prospects of experiments by radio manufacturers to eliminate batteries in favor of electric circuits in new type radio equipment. Lead consumption in other industries will continue on a huge scale whatever develops in radio improvements.

ALUMINUM

A large demand and a steady market features the aluminum

situation. The automobile industry and other consuming outlets provide a constant measure of support to this market, and the strength of domestic influences keeps this market practically immune from any suggestion of weakness or even the semblance of a drab background. The domestic product, a heavy one, and large importations of foreign metal, are readily absorbed. Current needs have been able to take care of productive capacity without depressing values. Conditions appear to be in a healthy state, and prices remain unchanged at 26c for Commercial 99% plus Virgin ingot and 25c for Metallurgical 94-99% grade.

ANTIMONY

A generally firmer market has developed in antimony, which is a reflection of the present disturbed conditions in China. Recent business was reported at 13½c duty paid for May-June arrival and there were indications that buyers were ready to pay 13⅝c. Offerings for shipment or afloat are restricted owing to the uncertainty regarding getting material out of China while the crisis over conditions in that country continues. Consumption is on a large scale and the prospects are a steady domestic demand. Market changes show a decided gain in price during the last half of March, and buyers were inclined to follow the upward trend for fair amounts.

QUICKSILVER

A sharp rise in prices and an active demand were recent features in the quicksilver market. Early in March quotations were $102.50 to $103 per flask, but a sudden spurt sent the price to $104.50 and since then the market has soared to $115 per flask. The sinking of a vessel with about 700 flasks aboard for this port served to materially strengthen the local market. Liberal arrivals from Spain relieved the tight spot position to some extent, but stocks are considered below normal. Scarcity of supplies is due to restricted production and increased consumption. Current market strength is therefore likely to continue.

PLATINUM

A fair demand was reported, but market changes were narrow lately. Refined platinum quotes $101 to $102 per ounce.

SILVER

Price of silver moved in a narrow range during recent weeks. There was no notable development to create any marked change in values or arouse enthusiasm over the immediate outlook. Since the beginning of March the net gain is almost nil. The trading attitude on the part of dealers in New York, San Francisco, London, Bombay and Shanghai has not been one of pronounced optimism lately, but nevertheless the month-end saw a little firmer tone to the market at 56¼ cents than at the middle of the month when the bullion price was 54¼ cents an ounce. Silver stocks at Shanghai recently were reported at 134,778,000 fine ounces a few weeks ago and compared with 123,948,000 ounces on January 4th. Stocks of silver in India about five weeks ago were 352,241,000 ounces. These huge stocks represent an accumulation of supplies which necessarily have a decided influence on the international situation of the precious metal. About 65% of all the silver produced has found its way to China and India.

OLD METALS

Demand for copper and brass scrap was well maintained during the past month. The export movement was specially good and reached large volume for desirable material. Supplies moved freely into consumption, and certain grades found ready buyers for domestic account. Weakness in the markets for primary copper and lead was reflected, however, in more caution among buyers and an easier tone for certain grades. The export inquiry remained a steadying factor, and prices gave way only slightly for choice parcels and not in a way indicating overselling. Foreign buying was particularly active, and this demand gave special support to market conditions. Buying prices are quoted at 10¾c for heavy copper, 9¼c for light copper, 6¾c @ 7c for heavy brass, 5¾c @ 6c for light brass, 6c for heavy lead, 4c @ 4¼c for old zinc, and 19c for aluminum clippings.

WATERBURY AVERAGE

Lake Copper—Average for 1926, 14.188—January, 1927, 13.375—February, 13.125—March, 13.50.

Brass Mill Zinc—Average for 1926, 7.783—January, 1927, 7.10—February, 7.10—March, 7.10.

Daily Metal Prices for the Month of March, 1927

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	7	8	9	10	11	14	15	16	17
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50
Electrolytic	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25
Casting	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb.													
Prime Western	6.825	6.825	6.825	6,825	6.80	6.80	6.75	6.75	6.775	6.75	6.725	6.725	6.725
Brass Special	6.90	6.90	6.90	6.90	6.875	6.85	6.825	6.825	6.875	6.825	6.80	6.80	6.80
Tin (f. o. b., N. Y.) c/lb. Duty Free													
Straits	69.625	69.50	70.50	70.50	70.125	69,875	70.25	70.25	69.50	68.875	69.50	69.375	69.25
Pig 99%	67	67.50	68.25	68.50	67.875	68.00	68.25	68.75	68.125	67.625	68.125	68.125	68.25
Lead (f. o. b. St. L.) c/lb. Duty 2⅛c/lb.	7.45	7.45	7.55	7.525	7.525	7.525	7.50	7.50	7.40	7.40	7.40	7.40	7.40
Aluminum c/lb. Duty 5c/lb.	26	26	26	26	26	26	26	26	26	26	26	26	26
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	13.50	13.25	13.125	13.125	12.75	12.75	12.50	12.50	12.25	12.50	12.50	12.00	12.00
Silver c/oz. Troy Duty Free	56.50	56.125	55.50	55.625	55.75	55.875	55.25	55	55	54.75	54.25	54.25	54.375
Platinum $/oz. Troy Duty Free	103	103	102	102	102	102	102	102	102	102	102	102	102

	18	21	22	23	24	25	28	29	30	31	High	Low	Aver.
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	13.50	13.50	13.45	13.45	13.45	13.375	13.375	13.25	13.25	13.25	13.50	13.25	13,450
Electrolytic	13.25	13.25	13.25	13.25	13.20	13.125	13.125	13.10	13.00	13.00	13.25	13.00	13.209
Casting	13.00	13.00	13.00	13.00	12.875	12.75	12.75	12.625	12.625	12.625	13.00	12.625	12.924
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb.													
Prime Western	6.70	6.65	6.70	6.70	6.65	6.65	6.60	6.55	6.55	6.575	6.825	6.55	6.714
Brass Special	6.775	6.725	6.75	6.75	6.725	6.725	6.675	6.625	6.625	6.625	6.90	6.625	6.786
Tin (f. o. b., N. Y.) c/lb. Duty Free													
Straits	69	69	69.50	68.875	68.75	68.375	68.00	68	68.75	68.75	70.50	68.00	69,310
Pig 99%	68	68	68.625	68.00	67.75	67.375	66.75	66.75	67.375	67.25	68.75	66.75	67,837
Lead (f. o. b. St. L.) c/lb. Duty 2⅛c/lb.	7.35	7.35	7.35	7.30	7.30	7.20	7.20	7.10	7.10	7.10	7.55	7.10	7.364
Aluminum c/lb. Duty 5c/lb.	26	26	26	26	26	26	26	26	26	26	26	26	26
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	12	12.25	12.625	13	13.25	13.50	14.00	13.75	13.50	13.50	14.00	12.00	12.875
Silver c/oz. Troy Duty Free	54.75	55.50	55	55	55.125	55.375	55.50	55.625	56.25	55.75	56.50	54.25	55.310
Platinum $/oz. Troy Duty Free	102	102	102	102	102	102	102	102	102	102	103	102	102.087

Metal Prices, April 4, 1927

NEW METALS

Copper: Lake, 13.25. Electrolytic, 13.00. Casting, 12.75.
Zinc: Prime Western, 6.55. Brass Special, 6.625.
Tin: Straits, 70.00. Pig, 99%, 68.00.
Lead: 7.00. Aluminum, 26.00. Antimony, 13.125.

Nickel: Ingot, 35. Shot, 36. Elec., 39. Pellets, 40.
Quicksilver: flask, 75 lbs. $118.00. Bismuth, $2.70 to $2.75.
Cadmium, 60. Cobalt, 97%, $2.60. Silver, oz., Troy, 56.50.
Gold, oz., Troy, $20.67. **Platinum,** oz., Troy, $102.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10½to11½
Brass Ingots, Red	12 to13
Bronze Ingots	13 to14½
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	23 to40
Manganese Bronze Ingots	13 to16½
Manganese Bronze Forging	32 to40
Manganese Copper, 30%	25 to35
Monel Metal Shot	28
Monel Metal Blocks	32
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	13½to15
Phosphor Copper, guaranteed 15%	18⅞to22½
Phosphor Copper, guaranteed 10%	18 to21½
Phosphor Tin, guaranteed 5%	70 to80
Phosphor Tin, no guarantee	70 to80
Silicon Copper, 10%....according to quantity	28 to32

OLD METALS

Buying Prices		Selling Prices
11¼to11¾	Heavy Cut Copper	12¾to13¼
10¾to11¼	Copper Wire	12¼to12½
9¼too 9¾	Light Copper	10¾to11
9 to 9½	Heavy Machine Composition	10 to10¼
7½to 7¾	Heavy Brass	8¾to 9
6¼to 6½	Light Brass	7½to 7¾
7¼to 7½	No. 1 Yellow Brass Turnings	8¾to 9¼
8¼to 8¾	No. 1 Composition Turnings	9¾to10¼
6¼to 6½	Heavy Lead	7¼to 7½
4¼to 4½	Zinc Scrap	5¼to 5¾
10 to11	Scrap Aluminum Turnings	13 to15
14½to15	Scrap Aluminum, cast alloyed	18 to19
20 to20½	Scrap Aluminum, sheet (new)	22½to23
38 to40	No. 1 Pewter	42 to44
12	Old Nickel Anodes	14
18	Old Nickel	20

Wrought Metals and Alloys

COPPER SHEET

Mill shipments (hot rolled)	21c. to 22c. net base
From stock	22c. to 23c. net base

BARE COPPER WIRE

15¼c. to 15½c. net base, in carload lots.

COPPER SEAMLESS TUBING

24c. to 25c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	20½c. net base
100 lbs. to 200 lbs. in one order	21 c. net base

ZINC SHEET

Duty sheet, 15%	Cents per lb.
Carlod lots, standard sizes and gauges, at mill, less 8 per cent discount	11.00 net base
Casks, jobbers' price	12.25 net base
Open Casks, jobbers' price	12.75 to 13.00 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	38c.
Aluminum coils, 24 ga., base price	34.7c.
Foreign	40c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Hot Rolled Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c or over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 56½ to 58½.

BRASS MATERIAL—MILL SHIPMENTS

In effect February 28, 1927
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.18⅜	$0.19⅞	$0.21⅞
Wire	.18⅞	.20⅜	.22⅜
Rod	.16⅛	.20⅝	.22⅝
Brazed tubing	.26⅜	......	.31⅝
Open seam tubing	.26⅜	......	.31⅝
Angles and channels	.29⅜	......	.34⅝

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

23¼c. to 24¼c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20⅜c. net base
Muntz or Yellow Metal Sheathing (14"x48")	18⅜c. net base
Muntz or Yellow Rectangular sheet other Sheathing	19⅜c. net base
Muntz or Yellow Metal Rod	16⅜c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	26¼c.	10% Quality	29¼c.
15% "	27¾c.	15% "	33 c.
18% "	29 c.	18% "	36¼c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base)	35	Hot Rolled Sheets (base)	42
Cold Drawn Rods (base)	43	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, April 4, 1927

ANODES

Copper:	Cast	20½c. per lb.
	Rolled	19⅝c. per lb.
	Electrolytic	20½c. per lb.
Brass:	Cast	19½c. per lb.
	Rolled	19⅝c. per lb.
Zinc:	Cast	13¾c. per lb.
Nickel:	90-92%	45c. per lb.
	95-97%	47c. per lb.
	99%	49c. per lb.

Silver: Rolled silver anodes .999 fine are quoted from 58½c. to 60½c. per Troy ounce, depending upon quantity purchased.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 84/68 Unbleached	$27.65-28.85
14" 20 ply 64/68 Unbleached	35.55-35.90
12" 20 ply 80/92 Unbleached	29.50
14" 20 ply 80/92 Unbleached	40.00
12" 20 ply 84/92 Unbleached	34.25-40.50
14" 20 ply 84/92 Unbleached	46.40-54.40
12" 20 ply 80/84 Unbleached	35.40-36.50
14" 20 ply 80/84 Unbleached	48.00-49.15

Sewed Pieced Buffs, per lb., bleached 60–75c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11-.16
Acid—Boric (Boracic) Crystals	lb.	.12
Chromic	lb.	.32
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.19-.23½
Denatured, bbls.	gal.	.44
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.042
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—Sulphate, tech. bbls	lb.	.03¾
Sulphocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls	lb.	.29
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdegris)	lb.	.37
Carbonate, bbls.	lb.	.17
Cyanide (100 lb. kegs)	lb.	.50
Sulphate, bbls.	lb.	.05½
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59–.61
Iron, Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.21
Nickel—Carbonate dry, bbls	lb.	.29
Chloride, bbls.	lb.	.17–.21
Salts, single 300 lb. bbls	lb.	.10¼
Salts, double 425 lb. bbls	lb.	.10
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09¼
Potassium Bichromate, casks (crystals)	lb.	.08½
Carbonate, 96-98%	lb.	.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.06
Silver Chloride, dry	oz.	.86
Cyanide (fluctuating)	oz.	.60
Nitrate, 100 ounce lots	oz.	.42½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.20
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¼
Phosphate, tech., bbls.	lb.	.03¼
Silicate (Water Glass), bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.48½
Tripoli, Powdered	lb.	.03
Wax—Bees, white ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls.	lb.	.11–.12
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03½